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Sales Efficiency

DIRECTORS with a technically-minded bias, who often control small-to-medium size firms, are so preoccupied with production problems that it is admittedly difficult for them to get a balanced view of the interdependence of the totally different functions of producing efficiently and selling efficiently. The former counts in their estimation far too much, the latter not enough. A fixed principle in any manufacturing business should be that however excellent the product or service is, it will not achieve and maintain optimum success until sufficient people know about it. This means that an efficient sales organization is essential. The paramount importance of efficiency in their selling organization is recognized by all the biggest and most successful firms in industry. They plan their sales activities carefully. They accept as an axiom that however excellent their products may be, they have got to tell the world about them, and keep on doing so. The cost is justified because it keeps the works busy and earns profits. It is obvious for economic and other reasons the great bulk of small and medium-size firms cannot operate in the expensively equipped, self-contained and streamlined manner of the big organizations. But that does not mean that they need be precluded from obtaining a commensurately high degree of sales efficiency by methods suitable to their circumstances and needs. The first prerequisite is the right attitude of mind.

Because in the early days of the Industrial Revolution no other reliable means existed of maintaining contact between seller and customer than the periodical visit of "our Mr. Blank," the "Rep." came to be regarded, and in many quarters still is, as the one essential instrument for developing and maintaining a satisfactory volume of orders. In modern business, however, the outside representative, although still essential, should be recognized as only a part of the complete sales set-up. His twofold function is to maintain existing contacts, and to break new ground. Too often, however, how limited is the time available for effective work at the point of contact is apt to be overlooked. Hence, the importance of the telephone as an adjunct to the efforts of the outside man. A sound rule is not to make a personal visit when a telephone conversation will serve the purpose equally as well. Very few buyers will feel slighted, and most welcome it, because it saves their most valuable commodity—their time. Inside, systematic records are of great assistance to the efficient working of a sales department. Enquiries should be promptly dealt with, quotations furnished with the minimum delay, orders should be acknowledged the same day as received, and every effort should be made to maintain a reputation for reliability in keeping delivery and other promises.

In this competitive age it must be remembered that publicity is essential if one wants to be known outside of one's own street. Public relations is another activity coming within the purview of the sales organization. Too many small firms do not realize how important it is to stand right with their buying public, however restricted. Yet what is sound policy for the nationally-known undertakings is equally as sound for the smaller people. It should be the special function of someone in any organization never to allow a customer, or prospective customer, to remain aggrieved over anything. Sales consultancy is another aid to efficiency which is still not sufficiently appreciated. Most people at some time have occasion to go for advice to solicitors about the law, to accountants about the presentation of balance sheets, and to works-efficiency experts about costing systems, factory layout and planning; and regard this as a perfectly natural procedure. Why, then, any hesitation about consulting a sales expert?

Out of the MELTING POT

Salvations

ONLY the other day (this page, METAL INDUSTRY, 22 August 1958, p. 148) I referred to the improvement brought about in the hitherto deplorable (at least according to the preamble to the patent specification) state of affairs obtaining in the prior art of brazing-metal compositions. The difficulties resulting, on the one hand, from the use of compositions requiring excessively high brazing temperatures and, on the other from the inferior heat resistance and durability of compositions with lower working temperatures, can be overcome, it has been suggested, by using ternary cobalt-copper-manganese brazing alloys within the composition range of 1-10 per cent cobalt, 55-95 per cent copper, and 4-35 per cent manganese. It is a pity that another specification that has just been published, being contemporaneous with that claiming the cobalt-copper-manganese compositions, has, therefore, not been able to include it in its survey of the prior art which it, too, finds to be deplorable. There was, for example, the disadvantage of copper-brazing, in that the high melting point of copper required the parts to be brazed to be heated to about 2,050°F., at which temperatures thin-walled parts were liable to distort, considerable grain growth was likely to occur, and the parts likely to suffer oxidation in the absence of a protective atmosphere. Brazing alloys of lower melting point containing silver had the disadvantage of limiting the service temperature of the brazed parts, and, because of their silver contents, of relatively high cost. Not having the advantage of knowing about the solution claimed to be provided by the cobalt-copper-manganese brazing alloys, this more recent invention has discovered a way out of the above difficulties in the use of a powdered brazing composition consisting of 85 to 97·5 per cent nickel and 2·5 to 15 per cent phosphorus. Typical compositions are: 97·1 per cent nickel, 2·9 per cent phosphorus (melting point about 1,800°F.) and 93·5 per cent nickel, 6·5 per cent phosphorus (melting point about 1,650°F.). The nickel and phosphorus may be present in powdered form as a mixture of nickel powder and red phosphorus. Alternatively, the powder may consist of a nickel-phosphorus alloy, the latter being prepared by reduction of a nickel salt in aqueous solution with sodium hypophosphite. The powder should be ground to pass a 200 mesh screen.

Facilitating

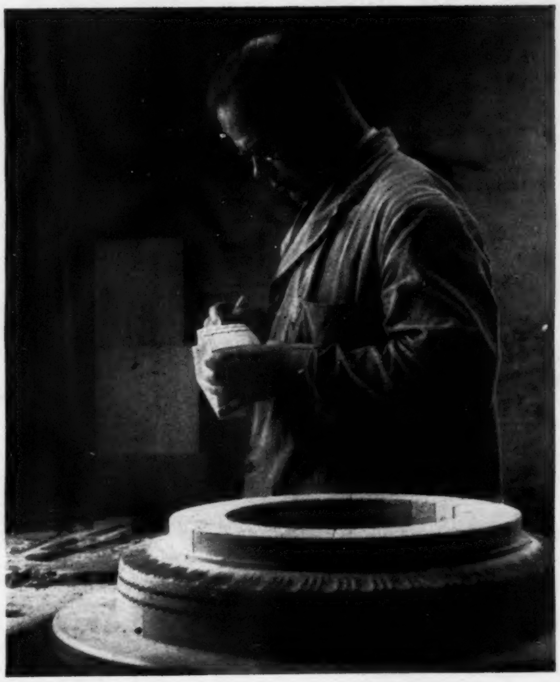
WITH so much to read, advice on the need for a greater selectivity is not unexpected and not unhelpful. In the absence of guidance in making the selection, it is only too easy to take the easiest course. Even if anything has been said about the advantages and, in fact, the necessity of specialization, it has done nothing to counteract the impression created by the prolonged implicit and explicit preaching on the dangers and drawbacks of specialization. From this impression it is only a short step to the conclusion that too narrow a choice should be avoided. Fortunately or unfortunately, depending on which way you look at it, this is where another of the factors aiding and abetting progress towards easier reading comes in. While it is difficult to avoid narrow specialization (assuming that this is desirable) by the choice and perusal of a sufficiently large volume of diverse reading matter, it is quite easy to select a relatively small volume of reading matter intended to give one a facile coverage of, if anything, an even wider range. Once this has been done, reading really becomes a pleasure—as witness the growing popularity of such reading matter. What is more, it has the advantage of apparently combining pleasure with business. The reader is left cherishing the belief that the time devoted to such reading is being well spent: he is absorbing useful authoritative information on subjects ranging from the latest political or economic crisis to the re-entry problem of space rockets, and at the same time he is thereby avoiding the pitfalls of narrow specialization. What should be considered here is the undoubted possibility of making the profitable narrow course of specialized reading equally pleasurable.

Usable Phenomena

BY way of an introductory reminder, it is probably advisable to mention that electrophoresis is the phenomenon of movement of electrically-charged particles in a uniform or divergent electric field, the direction of movement being determined by the direction of the electric field. It is also worth mentioning that electrophoresis is already being used as a means of depositing various finely-divided materials to form coatings. Finally, attention might once again be drawn to the fact that, while electrophoretic coating on its own is undoubtedly useful, and in many cases the only method that can achieve the desired end, it would also appear to hold out much promise and to offer interesting possibilities for investigation as a method to be used in combination with electroplating or chemical plating. Would some such combination provide a means of obtaining, for example, deposits consisting of silver, metal oxide, etc., to confer anti-welding and other special properties on the surfaces of electric contacts? By contrast to electrophoresis, the much more neglected phenomenon of dielectrophoresis depends on the tendency of matter to become polarized and to move into regions of highest field strength of a strong, divergent electric field. In dielectrophoresis, the motion of the particles is independent of the direction of the field, i.e. either D.C. or A.C. voltages can be used to provide the field. By contrast with electrophoresis, the phenomenon of dielectrophoresis has, as yet, not advanced beyond the stage of intriguing laboratory demonstrations of the phenomenon, such as those recently described by H. A. Pohl, of Princeton University. The set-up for such a demonstration comprises essentially two electrodes suitably shaped and arranged to provide a strong divergent field (e.g. 10,000 V across 5 cm.) to act upon the material. The phenomenon is most noticeable with rather coarse suspensions, liquids and powders. The effects dielectrophoresis may be arranged to produce include separation of the components of suspension, selective precipitation, and mixing. Certainly the most spectacular effects are those in which dielectrophoresis is used to make drops of liquid leave the main body of the liquid in the form of a jet above a single pointed electrode, or to hang or circle round a second electrode. The efficiency of such a dielectrophoretic pump is of the order of 20-25 per cent. Fine powders — copper sulphate, polyvinyl chloride, talc, sodium chloride, alumina, silica — are also "pumpable" in this way.

Skimmer

In celebration of the Golden Jubilee of the Institute of Metals, the Autumn Meeting this year is being held in Birmingham, and a number of Midland works are being visited by delegates. The Nuneaton Works of Sterling Metals Limited described below, is one of these. Two others, The Mint, Birmingham, Limited, and Rolls-Royce Limited, Derby, are also described in this issue.



Preparing a plaster pattern for tyre mould production

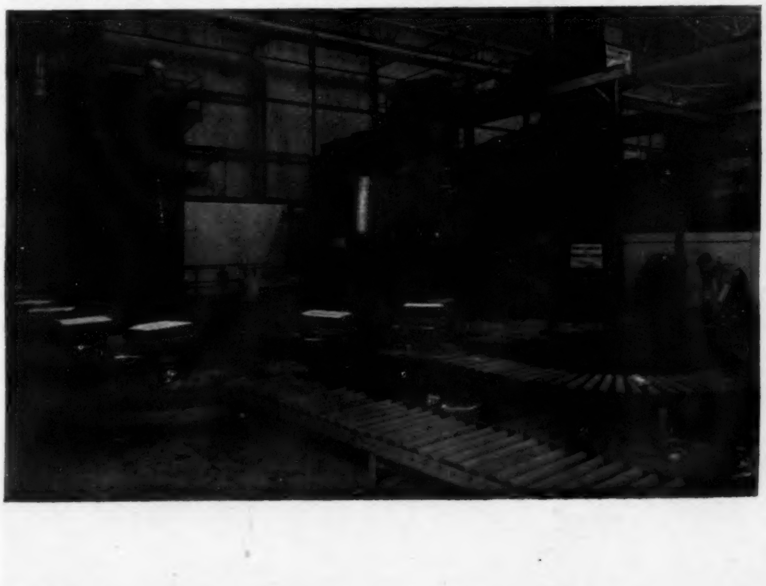
Sterling Metals Limited

STERLING METALS originated in Coventry during the year 1907. The Company began business on a small scale (about twenty people were employed) as one of the first producers of aluminium castings for the new and growing motor industry. In this field they were pioneers, and from the beginning aimed at high quality production. Considerable success was achieved, and in 1910 the first foundry was built at the Northey Road site, Coventry, to house the growing aluminium business and also to begin the specialized production of cast iron motor cylinder blocks and heads.

In 1921, the company took what proved to be one of the major steps in its history when it acquired the British manufacturing rights for the production of "Elektron" magnesium alloy castings. Sterling Metals had done much towards the development of aluminium castings, but this is quite overshadowed by the firm's early work in the development of magnesium as a constructional material for the aircraft and allied industries.

Operating under licence from F. A. Hughes and Co. Ltd., the British concessionaires of I. G. Farbenindustrie, experimental work began in 1922. Hitherto, magnesium had received small consideration in comparison with aluminium, and up to that time its uses in the United Kingdom had been confined mainly to pyrotechnics. To the layman magnesium meant fire, and early experiments in the foundry frequently ended in this fashion. Moisture was anathema, and in those early days moulds had to be cast in a completely dry condition. Problems were numerous and complex, but when sulphur and boric acid were mixed with the sand as inhibitors for the moisture content, a major problem had been resolved. With the advent of the patented Elrasel fluxes, the metal had become a practical proposition in the foundry, and by 1927 the firm had begun to produce magnesium alloy castings in bulk.

Sand conditioning plant and mechanical knock-out area in the light alloy mechanized foundry



The metal gives strength allied with extreme lightness (40 per cent lighter than aluminium). It was inevitable that the rapidly growing aircraft industries should become the prime users of the metal. In addition, there was an ever-widening field of application for magnesium in the commercial market. Larger premises were needed, and the board decided early in 1938 to erect a larger and better-equipped foundry for the production of magnesium alloy castings. The nearest available land for this purpose with appropiate services and facilities was found to be on the outskirts of the neighbouring town of Nuneaton, and building was started in 1939. This new foundry at Nuneaton was ready for production at almost the precise time as the parent department at Coventry was destroyed by enemy action during World War II.

Light Alloy Foundries

Before describing the light alloy foundries, it should be mentioned that new projects are pending, and both magnesium foundries will shortly be undergoing modifications. The following concerns only the current layouts.

The original foundry lies on the west side of the Nuneaton site and is known as No. 1, or the magnesium sand cast foundry. Between this building and the main entrance stands the new administration block, completed in 1956. Sand bunkers (charged from the outside) are installed at the

East bay of the light alloy mechanized foundry

south end of the foundry, complete with Fordath mixers and batch millers. Lynn 4F is the principal sand now used. Next to the left of the building is the core shop, which has recently been laid out entirely for CO_2 core production. On the right is the floor moulding section, with oil-fired furnaces centrally situated. The metal is melted in deep-drawn mild steel ladles, the largest being of 600 lb. capacity, and is conveyed to the moulds by overhead cranes. At the far end of the foundry are two slinger units (complete with sand mills and roller tracks) for bulk production of the larger castings. Situated at the north end of the building are two other departments, namely, the shell and plaster moulding section, producing precision castings in aluminium and magnesium, and the heat-treatment section, housing a battery of electrically-heated and controlled furnaces. Both pit and horizontal types are used.

In 1942, the building of a completely mechanized foundry began on the No. 3 Nuneaton site, specially designed for the employment of women, manpower being at a premium at this stage of the second World War. This "women's" foundry started production in 1943, and for the remainder of the war produced thousands of magnesium castings for the famous Lancaster and Mosquito aircraft.

All sand is milled at the north end of the building, and supplied to hoppers over each moulding machine by overhead conveyor. Moulds are produced on jolt-squeeze and rollover type machines and, after being cored-up and finished, are passed to a separate furnace room by automatic conveyor. After pouring, the moulds are passed through a cooling tunnel before reaching the shake-out, from which the empty boxes are returned to the machines by the same continuous conveyor. Skin drying of moulds is done by infra-red lamps. Spillage and used sand falls through grids, and is returned to the sand mills by underground belt conveyor.

After the war, one bay of this foundry was laid out for the production of the Ferguson tractor transmission casing, a casting weighing some 56 lb. in magnesium, and forming the backbone of the tractor. At full output, one of these castings was made every 1½ min. of production time, and before the conclusion of the contract over 500,000 of these castings were produced during a period of six years, with a negligible number of rejections on inspection. These castings have proved so reliable that it has not been found necessary to provide spares for service depots.

The west bay of No. 3 building houses the aluminium foundry, which produces, in a wide range of alloys, a large variety of aluminium castings weighing from a few ounces to 1,300 lb. each. Moulds are made by hand, by jolt squeeze machines, and a sand slinger unit. The bulk of the cores are produced by the CO_2 process.

Formerly there were separate fettling sections at each end of the aluminium and magnesium foundries, but now these are in the one building, situated between Nos. 1 and 3 foundries. The aluminium and magnesium fettling shops are divided by an inspection department which is common to both. It is insulated to prohibit the entrance of noise from other departments. In the fettling shops, the bulk of the runners and feeders are removed by band saws, with centre lathes and borers taking care of the larger castings, whilst the final trimming is done by pneumatic hammer and rotary files. Runners and head metal are segregated in their respective alloys by a water paint colour scheme.

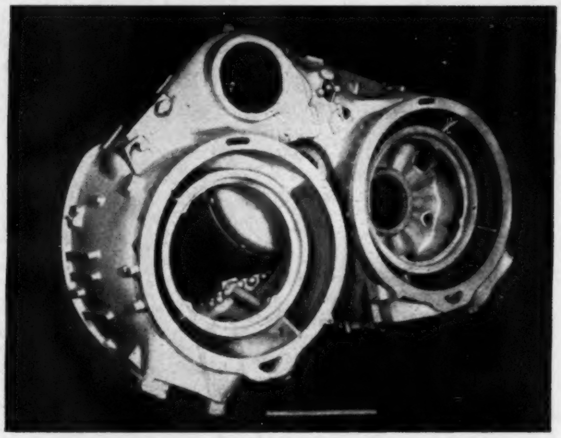
Magnesium castings are chromate treated before being passed through to the inspection department. In this latter section, all castings are given a visual examination, and on the larger castings this is followed either by a partial marking-out or a complete marking-out check. The majority of the aircraft castings are submitted to X-ray examination and the oil and chalk test, before being passed through to the despatch stores. A percentage of the aero landing wheel hubs and flanges undergo a physical fracture test and grain examination.

X-ray examination is carried out in the light alloy laboratory building situated at the north end of the light alloy foundries. This building includes a complete X-ray laboratory, consisting

The heat-treatment department in No. 1 light alloy foundry

of ten conventional units and one screening unit, a chemical laboratory for sand and metal analysis, a physical laboratory for the machining and pulling of test bars, and a metallography department.

At peak periods, the light alloy foundries have produced over 350 tons of aluminium and magnesium castings per month. A large percentage of these are airframe and aero engine castings, and it is true to say that the introduction of the newly-developed magnesium-zirconium and magnesium-zirconium-thorium alloys has made possible some of the phenomenal results achieved in the field of jet propulsion, axial flow turbines, and gas turbine engines, which have placed this country well to the fore in aircraft design and performance.



[Courtesy Armstrong Siddeley Limited

Armstrong Siddeley "Double Mamba" air duct in magnesium zirconium alloy R.Z.5

Apart from castings for the aircraft industry, however, the products of the light alloy foundries have many other applications and serve a very wide field of engineering. Some of the other major and diverse applications are: motor cars; heavy vehicles; marine and stationary engines; tractors and agricultural implements; electrical equipment; rock drilling machinery; dental and surgery equipment; food processing machinery; radar equipment; portable wood saws; shoe machinery, etc. During the past few years the company has devoted considerable time to the development of light alloy warp beams, dynamically balanced high speed warp beams, bobbins and backing drums, and now consider that to-day they can claim to be specialists in the production of ancillary equipment for textile machinery. It is interesting to record that the company's textile products are despatched in large quantities to Canada and many parts of the world.

Iron Foundry

The company's iron foundries are playing a considerable part in the post-war car boom. The Coventry iron foundry, in commission since 1910, was at this stage outmoded and outdated, but with the installation of new equipment and other improvisations it achieved a remarkable output. Concentrating almost entirely on cast iron cylinders and heads for cars and heavy vehicles, the monthly despatch weight figures were increased from 600 tons in 1948 to a peak of 1,550 tons in early 1956. It was obvious that this foundry was literally bursting its walls, and in June, 1954, the building of a new iron foundry commenced on a pre-prepared site (No. 4) adjacent to the light alloy sand foundries at Nuneaton.

Initial production began in June, 1956, and final transfer of labour, equipment and materials from the Coventry foundry was completed in May, 1958.

Melting is done by a battery of four hot blast cupolas, each capable of melting 12 tons/hr. of high duty grey iron (B.S.S. 1452 grades 14, 17). Special features of this melting plant are the semi-automatic charging systems, the hot blast recuperators, the external jacket water-cooling system, water-cooled tuyeres, front continuous slagging and tapping system, and hot metal oil-fired receivers. The casting bay is provided with low level wall cranes, which pass the ladles of molten iron to high level gantry cranes, from which it is poured into the moulds. The latter are carried into the casting bay on a series of pallet mould conveyors, each conveyor encircling a moulding machine unit and its ancillary equipment. The moulding shop is a highly mechanized section, built into separate units, with sandslinger or automatic indexing machines for mould production, while the core shop is an interesting combination of the traditional oil-sand production and the modern synthetic resin and CO_2 methods. New types of machines for producing resin-bonded and CO_2 cores open up a completely new field of core shop technique.

Fettling and inspection shops are situated in one large double bay, and several special features have been introduced. Modern grinding machines eliminate many of the heaviest and most arduous dressing operations, and a completely mechanized Wheelabrator plant at each end of the dressing and inspection shop ensure a flow of work which reduces handling operations to a minimum. A pendulum conveyor services all production units in the foundry, passes through to the sand mixing plant, and then into the fettling shop, returning to the foundry via the metal stockyard. It is, therefore, passing through or by all the vital locations of the production plant. Its functions are numerous — allowing cooling time for castings after knock-out, conveying castings from one production stage to another, conveying usable reclaim sand back into the foundry and reject sand to waste silos, and scrap, tramp metal, etc., back to the stockyard. The conveyor, some two miles in length, is an integral unit in the overall plant and is, in fact, the main artery of the organization.

The modern cylinder block must rank high amongst the more intricate products of present-day foundry technique, particularly in view of the high quality required to withstand gas and water pressure under service conditions. Considerable attention is paid to the development of the correct material, which must be hard wearing, have even grain structure through thick and thin sections, be free from porosity and brittleness, and, by no means least in these days of mass production, be capable of machining at high speeds. The iron foundry laboratory is situated in a separate block at the north-west corner of the main building, and it is here that technicians maintain constant control of sand and metal by analysis, micro-examination, and mechanical tests. Dimensional accuracy is ensured by employing high-grade pattern equipment with accurate coring-up gauges. As a final check, all castings are passed through jigs on final inspection.

Ancillary Departments

At the north end of the Nuneaton site, and central to all foundries, is a modern pattern shop employing, among others, some thirty skilled patternmakers. The pattern shop was one of the last departments to be moved from Coventry to Nuneaton. Its comprehensive equipment includes Wadkin wood millers, milling machines, borers, Archdale drilling machines, lathes and band saws for both metal and wood. Near the pattern shop is a small toolroom, its principal functions being the machining and assembling of the various textile accessories previously mentioned, and the fitting together of moulding box parts. In this area, too, are an attractive canteen (capable of serving 850 meals at a time) and an ablutions block, catering for the welfare of employees. Finally, at this north end of the site are the various maintenance shops which service the whole of the works. Mechanization has virtually eliminated that *rara avis*—the moulder, but has considerably increased the responsibilities of millwright and electrician.

The Mint, Birmingham, Limited

By D. J. ROGERS

ORIGINATING in the early 1800's, when four brothers named Heaton started a general engineering business in Shadwell Street, Birmingham, The Mint, Birmingham, moved to the present site in Icknield Street in 1861, after purchasing from Boulton and Watt the coining equipment from the old Soho Mint in 1850. For a number of years the company was engaged entirely in the production of coinage, and since starting production, coins have been struck for almost every country of the world.

The demand for coinage has gradually decreased over the years, mainly because most countries have now laid down their own mints. Although coinage is still an important part of the company's production, its main activity is the manufacture of sheet, strip and tube in copper and its alloys.

Casting

The casting department is at present being re-organized, and a rebuilding project is now well under way. The existing department contains a battery of four Ajax-Wyatt low-frequency induction furnaces, each of a capacity of 672 lb. (Fig. 1). The furnace charges are poured into copper-faced water-cooled moulds of the Junkers type to produce slabs for rolling, the standard size of slab being 3 ft. 6 in. by 2 ft. 2 in. by 1½ in. thick. For billet production or cupro-nickel strip, cast iron moulds are used, mounted on a turntable.

The weekly output from these furnaces when in full production is approximately 100 tons, and consists mainly of alpha and alpha-beta brasses to B.S.S. 265, 266 and 267, as well as leaded brasses, gilding metal, phosphor bronze, coinage bronze, cupro-nickel, and de-oxidized copper in the form of billets.

Laboratory control of analyses of castings decides whether the material will be hot or cold rolled in its initial stages. All castings from the electric furnaces are colour marked for quality identification, stamped with a serial number, and marked whether to be hot or cold rolled.

Before issue to the rolling mills, the gates are cut off the 24 in. slabs by means of a circular saw.

Hot Rolling

The main feature of the hot rolling department is a two-high stand of rolls for hot breaking down (Fig. 2). The rolls are variable speed and reversible, the roll sizes being 22 in. diameter and 5 ft. face. This mill is powered by a 390 h.p. D.C. motor developing approximately 1,000 h.p., the current being supplied by a 265 h.p. A.C. motor generator with 800 kW D.C. output. Brass slabs and copper cake, before rolling, are preheated in the latest type of Incandescent gas-fired walking beam furnace, which delivers material at the correct temperature for rolling at the rate of 5 tons/hr. According to the type of material to be rolled, the furnace temperature varies between 750°C. and 900°C.

From the furnace, the slabs or cakes are delivered on to a live roller table and conveyed on to the rolls, where they are reduced in seven or eight passes down to 0·260 in.

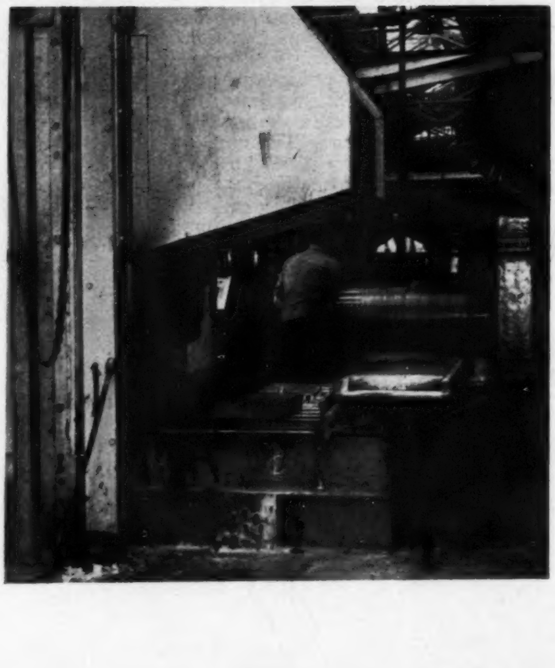
Milling

From the hot rolling mill the broken down slabs and cakes are transported to a Torrington slab miller (Fig. 3) by means of overhead crane. After passing through a heavy nine-roll flattener, they are carried by roller conveyor to the actual milling machine, where surface defects are removed from the broken-down slab by passing it over a milling cutter. The milling cutter is of the segmental type. Cutter life varies according to material being milled, but averages between 250-300 strips between regrinds.

Cold Rolling

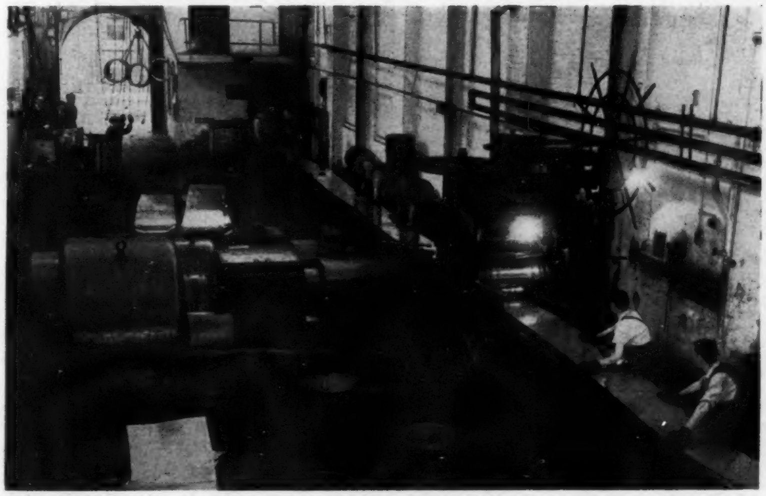
After milling, the strips are transported to a two-high reversing mill having rolls 17 in × 32 in. (Fig. 4). The strips, which are 0·250 in. thick by 24 in.-26 in., from the Torrington miller, are then rolled to a standard

Above: Fig. 1—Pouring from Ajax-Wyatt furnaces into Junkers-type moulds



Right: Fig. 2—Two-high reversible breakdown mill with Incandescent gas-fired walking beam furnace in foreground

Fig. 3—Torrington slab miller



Above: Fig. 4—Two-high 32 in. cold reversing mill

Left: Fig. 5—Serck-type 700 ton vertical extrusion press

0·110 in. (brass) or 0·055 in. (copper). If required for strip production, the strips are sheared to narrower width by shears mounted adjacent to the rolls, or if required for sheet production, are rolled further in the 24 in.-26 in. width.

All subsequent rolling is carried out mainly on standard two-high mills normally fitted with press-button control. Automatic coiling where necessary, and in some cases back and front tension, are used. The follow-on rolling is all cold, with intermediate annealings, and in all cases a 50 per cent reduction in thickness is achieved between anneals in order to ensure satisfactory grain structure and working properties.

In the case of castings which are not suitable for hot working, due to composition or size, these are broken down cold on a heavy two-high cold breaking-down mill.

The annealing, both interstage and final, is carried out in pyrometer-controlled muffles of the following types: (i) gas-fired batch type (Gibbons); (ii) gas-fired water-sealed (Bates and Peard); (iii) electrically heated.

Cleaning after annealing is carried out on machines using: (i) immersion in 50 per cent sulphuric acid; (ii) water spray and brush; (iii) squeegee rollers; (iv) steam roller drying or hot air blast; (v) through high-speed wire brushes.

A wide range of tempers and finishes is produced in sheet and strip in copper, brass, phosphor bronze and gilding metal, gauges ranging from 0·005 in. to 0·375 in. thick, and widths from $\frac{1}{4}$ in. to 24 in.

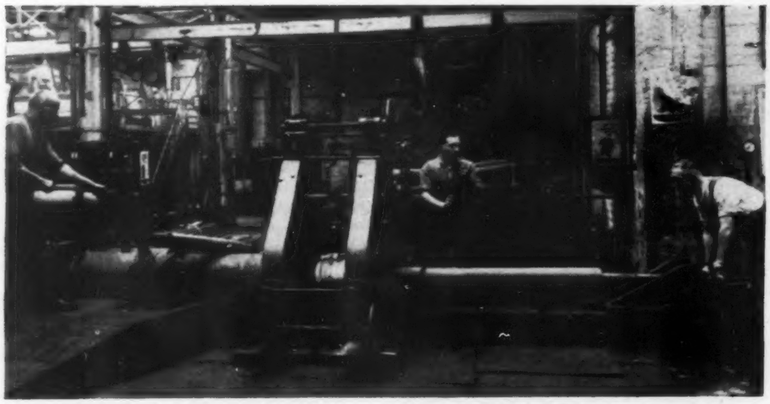
In addition to the above, large quantities of silver, coin bronze, cupro-nickel and various alloy strips are produced for the manufacture of coinage, all of these being blanked and struck in the minting department.

Tube Manufacture

The copper and brass shells for the manufacture of tubes are produced in two ways—by extrusion and rotary piercing. In the extrusion process, a Serck-type vertical 700 ton extrusion press is used (Fig. 5). A preheated 4 in. billet is placed in the press container and extruded over a mandrel and through a die to form a tube shell 1$\frac{3}{8}$ in. by 0·090 in. thick. For the larger sizes of tube shells, copper billets are rotary pierced by means of the Mannesmann rotary piercer (Fig. 6).

Shells produced from extrusion and rotary piercing are then drawn down to produce varying finished sizes of tubing. The drawing operations are mainly carried out on standard type drawbenches by means of twin plugs.

For the production of domestic water service tubing, a Head Wrightson push pointing, fully automatic, triple-draw tube bench is used. The bench is arranged so that one, two or three tubes can be drawn simultaneously. The tubes are drawn over plugs, and reductions of 30-35 per cent



Piercing copper billets on the Mannesman rotary piercer

in cross-sectional area are obtained on each draft.

All interstage annealing, and also final annealing, of tubes is carried out in a gas-fired, controlled atmosphere bright annealing furnace, the purge gas supplied into the furnace being burnt town's gas.

The range of products produced from the tube mill covers round and shaped tubings in copper and brass, with sizes varying from ¼ in. O.D. up to 4 in. O.D., and tempers according to requirements.

Sundries Department

A considerable amount of strip, sheet and tube is consumed in the sundries department, where a variety of metal working operations is carried out.

Tubing is cut up and fabricated into a complete range of M.B.L. capillary fittings for use with domestic water service tubing. Cistern balls and floats (soldered, solderless and brazed) are pressed from copper strip, jointed and finished, and a variety of small presswork carried out for a wide range of customers.

Material in sheet form is printed, etched and coloured to produce chemically engraved nameplates.

Rolls-Royce Limited: Derby

FORMED in 1906 to manufacture motor cars to the designs of the late Sir Henry Royce, the reputation of Rolls-Royce Limited during its formative years was built on uncompromising adherence to sound engineering principles. This tradition has been maintained to the present day. In 1914, Rolls-Royce started the design of their first areo engine, and since then this part of the company's activities has been the most important factor in the company's growth.

The Aero Engine Division of the company employs more than 33,000 on the design, development and manufacture of aero engines, rocket motors, and nuclear power units. At the present time, Rolls-Royce gas turbine engines have been ordered by, or are in service with, over 60 airlines, and Rolls-Royce have over half the world orders for the engines for prop-jet and turbo-jet powered aircraft for civil operation.

Rolls-Royce engines power two of the V-bomber types on order for the R.A.F., and also the English Electric P1B supersonic fighter, Hawker Hunter, English Electric Canberra, Supermarine Scimitar, and the de Havilland Sea Vixen.

The company are currently engaged on the manufacture of rocket motors for the de Havilland I.R.B.M., and also associated with work on the power unit for Britain's first atomic powered submarine, H.M.S. Dreadnought.

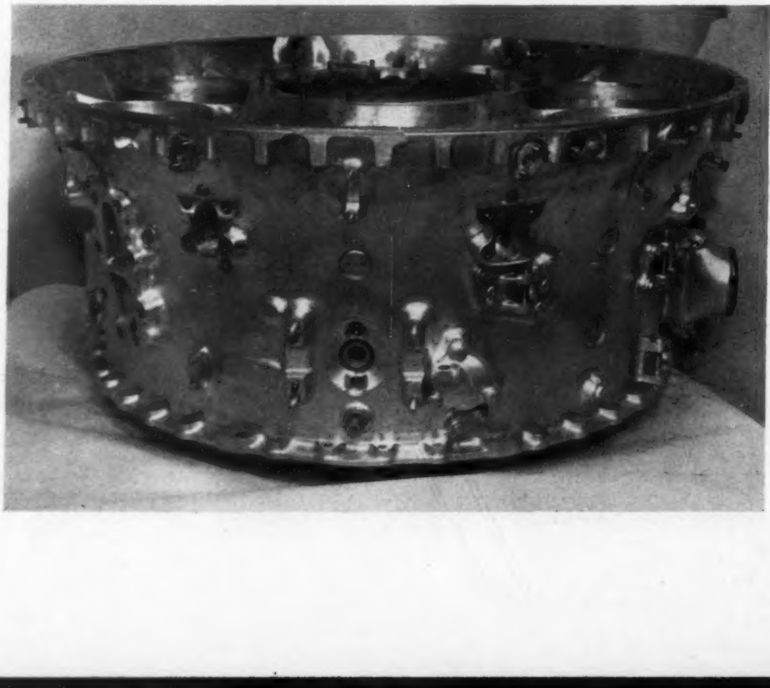
At the Aero Engine works, many of the components that go into the rotating parts of the turbo-prop and turbo-jet engines start their life as forgings. On receipt, these forgings and all other incoming materials are subjected to careful examination, samples being taken for laboratory examination from representative batches. In the case of turbine discs, from every forging a test piece is taken for examination, the sample being retained for reference.

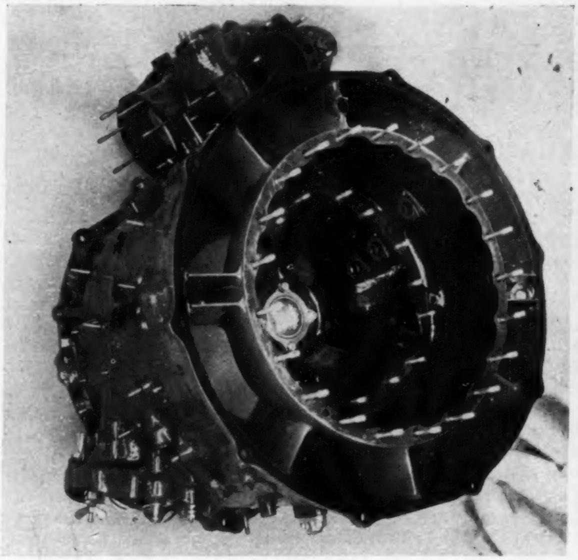
Turbine blades are machined in the No. 1 machine shop, and here all sizes of blade, for both civil and military prop-jet and turbo-jet engines are dealt with. For the turbine blades, the materials are normally one of the Nimonic alloys—Nimonic 80 or subsequent developments in this alloy range.

In this shop, a very wide range of operations is undertaken, including milling of the faces, broaching of the "fir-tree" root, and grinding. Equipment is of fairly conventional high grade machine tools, although some of the copy millers and grinders on which the aerofoil form is accurately generated are of special interest. For almost all operations the jigs and fixtures are of a specialized nature, designed and manufactured by the company.

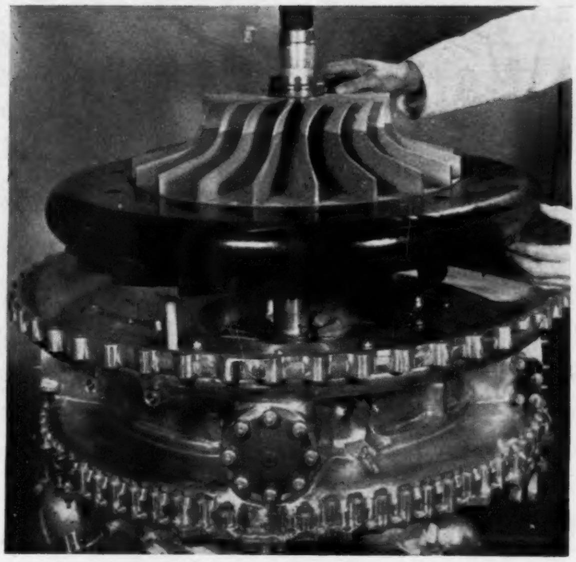
Between each of the machining operations, inspectors carry through visual and physical checks to ensure that no faulty component is passed through to a subsequent operation. On completion of the machining operations, each blade is subjected to a "Zyglo" flaw detection test. Among the many types of inspection tests in use, mention must be made of the profile check for the "fir-tree" root,

Rolls-Royce "Avon" compressor outlet casing cast in aluminium





Rolls-Royce "Dart" intake casing and propeller reduction gear housing cast in magnesium alloy



"Dart" compressor assembly. Casing cast in aluminium alloy, impeller forged from aluminium alloy and the rotating guide vanes forged steel

which is projected at a 25× magnification and examined against a master profile.

Finishing the turbine blades involves a number of other operations, including heat-treatment, vapour blasting, and electropolishing. In this shop, too, turbine discs and compressor wheels are manufactured, mostly in stainless steel. These are produced from forgings, and the machining operations include facing, turning, drilling, reaming, etc.

From the machining viewpoint, the gear shop is of considerable interest, and many of the machines installed are designed for special purposes to meet the exacting demands made by the high speeds and thrusts developed by engines of the type being manufactured. High surface finish, freedom from chatter and interchangeability of gears are also important factors, and these considerations have dictated the selection of machines. The Gleason bevel gear grinding machines, though not now new, were a major development a few years ago when each pair of gears had to be individually matched. An important development has been the design of two gear grinders for finishing the internal helical teeth of the reduction gear of the "Dart" engine. These machines are the result of close co-operation between Rolls-Royce and the machine tool manufacturers, and the success achieved with them has considerably improved the standard of tooth finish and accuracy.

In the forging shop, blades for axial compressor type engines are coined, machined and trimmed. These blades, of which there are almost 200 different types (although some of the differences may only be dimensionally slight), are manufactured from forgings in light alloy, steel, and, in some cases, titanium. For the upsetting and coining operations, Wilkinson and Mitchell "Forgemaster" presses are used, pre-heating being carried out in Brayshaw furnaces.

A feature of the production here is the attainment of high accuracy from the coining tools, and a great deal of work goes into the design, making and maintenance of these dies. Because of the relatively short life of the die blocks, the maintenance department for reconditioning dies and repolishing the die impressions is situated adjacent to the forging presses.

The coining operation is designed to complete the aerofoil section of the blades, no machining being necessary on the blade form or root radius. This, in itself, is considered to be something of an achievement.

Machining of the blade root is also carried out in this department and, as with turbine blades, the strictest attention is paid to inspection between operations.

The engine erection shop includes the initial building of sub-assemblies for engines such as the "Dart," "Avon" and "Conway." Parts are issued in sets from the component stores, and as the various sub-assemblies are completed they are individually tested. In this shop one of the more interesting tests is the dynamic balancing of rotating parts on Gisholt machines. Overspeed testing of turbine discs is a further safety test carried out to ensure the performance of these vital parts of the engine, all discs being tested up to speeds in excess of maximum operational speeds.

One major development in sub-assemblies, directly connected with the work done in the research and development sections, is the success achieved with cooling and heat dissipation in flame tubes. At one time these had a very short life, after which severe buckling and distortion occurred. The present design incorporates perforations so placed as to provide maximum dissipation of heat, and the flame tubes now have a life comparable with other parts of the engine.

Final assembly of "Dart," "Avon" and "Conway" and other engines, for civil and military aircraft, is also carried out in this shop.

A large research and development section is housed at Sinfin. Here, there are vibration, combustion, and electrical laboratories, and numerous test beds for both development and production engines. In the vibration laboratory, extensive work is undertaken on all problems associated with vibration, stress, etc. For this purpose, engine components such as turbine discs, or ancillary parts subject to vibrational or rotating loads, are prepared for test by the fitting of strain gauges at significant points.

The combustion laboratory is engaged on research into such combustion problems as temperature distribution and the degree of combustion obtainable from the fuel. It is of interest to note in this connection that over 99 per cent combustion efficiency has been achieved, and this high figure is a feature of Rolls-Royce engines. Most of the work of this laboratory is carried out on single flame tubes.

The various test beds include specialized rigs for development work on new engines, as well as test beds for production engines. The latter include the final testing of the "Avon" and "Dart" engines, close observations being made of thrust or power, temperatures, and fuel consumption.

Finishing Supplement

Plating and Anodizing Rack Design

By H. KRAUS

Part I—Rack Design

This article, abridged from a recent issue of "Metal Finishing," describes some of the basic requirements underlying plating rack design, and discusses methods of obtaining maximum plating efficiency by the use of properly-designed contacts, auxiliary anodes etc.

PROPER rack construction and design are essential ingredients of the modern metal treating process. It is important, in the metal finishing field, to know the basis of rack construction and the materials used, not only for the purpose of manufacturing racks, but in order to request and properly to evaluate the racks manufactured by others. Proper rack design and the economical operation of the plating process cannot be separated.

Rack Design Principles

It is the plater who knows better than anyone the capabilities and limitations of his plating equipment. The plater's knowledge of the principles of rack design is an invaluable aid to the rack designer in discussing problems, and also enables the plater to know what to demand and expect from the rack manufacturer.

In order to begin the design of a rack, the essentials of the rack size, the type of plating bath and its specific characteristics and, of course, the critical area of the part to be plated must be known and defined.

Of equal importance before proceeding with the rack design is the consideration of the rack economics in the light of each plating problem. One of the first and biggest temptations is to place as many parts as possible on a rack. Quite frequently this can increase the labour, due to racking time involved, resulting in an unbalance of work load. The time required to rack should not be longer than any other step of the plating process. In the case of automatic equipment, racking time is definitely limited by the rack interval; time required to load and unload fixtures will determine whether or not the machine may be unintentionally run with empty rack spaces. Further, crowding parts makes racking more difficult, often requiring two hands and possibly resulting in damage to the rack. In addition, crowding the rack usually increases the possibility of rejects.

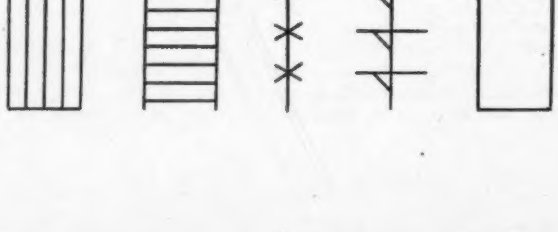
Occasionally, the plater discovers that the particular part to be plated requires more spacing between parts than he had estimated and, as a result, he may not be able to meet production schedules. In that case it is helpful to consider using auxiliary anodes, because these can now be made inexpensively and in such a way that they can be attached or removed easily, and need not travel through the whole plating cycle.

Another important consideration in modern rack design is the choice between replaceable and non-replaceable tips. The ideal would be a tip which can be replaced repeatedly without rework to the main frame or repair of the rack coating, and which can be moved to different locations or removed completely. All of this must be accomplished with a minimum of parts and a minimum of cost. Unfortunately, the ideal tip has never been developed, and probably never will be, particularly in the case of anodizing racks, where even the slightest penetration of solution will cause insulation and deadening of the contacts. The foregoing is not intended to give the impression that replaceable tips do not have their place in rack design, but rather to emphasize that their limitations must be considered when thinking of rack economics.

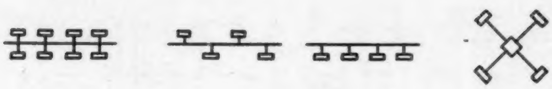
Frequently, the cost of replaceable tips is twice that of non-replaceable ones. When a contact itself is quite complicated, or the material of the main frame is valuable and there are quite a number of contacts per rack, the replaceable contact may be found economical. If the loss of 10 per cent of the contacts due to damage would cause serious production difficulties, the plater will find that replaceable tips will prove to be advantageous. However, if damage to 20 per cent of the contacts on the rack can be tolerated, the plater will find that complete rework is more economical, because even plating racks with replaceable tips frequently must be completely repaired. Those employing replaceable contacts should also keep in mind the fact that labour must be available to keep contacts replaced and do other minor repairs. Stocking and stock control of the contacts and components are necessary; further, there is an increase in the capital investment and the possibility of loss due to extra stock in case of contract cancellation or obsolescence of the parts to be plated.

The recent development of replaceable crossbars has resulted in a rather satisfying compromise. This has been particularly successful in cases where there are many contacts on a single crossbar and the contacts can be manufactured inexpensively. In these cases, the crossbar can be replaced or moved in much the same manner as an individual replaceable contact, giving the plater means to keep his racks fresh and yet enjoy the economic advantage of low initial cost without the need of stocking numerous parts. Crossbars then can be repaired at low cost just as any other small non-replaceable plating rack.

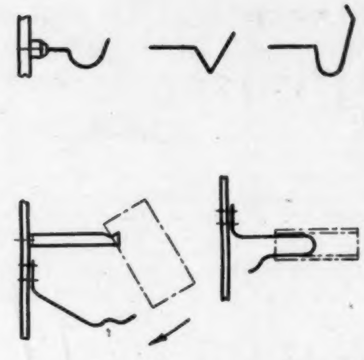
In the case of anodizing racks, the consideration of whether to use aluminium or titanium tips is of utmost importance. Anodizing racks with titanium wire tips or titanium strips fastened to aluminium strips are 20 to 30 per cent more expensive than all-aluminium racks. Unfortunately, this condition discourages many people from using titanium-tipped anodizing racks. The repair cost of a titanium-tipped rack is only 30 per cent of that of an aluminium rack. This figure refers to each separate repair cost. With titanium-tip racks, recoating and some replacement of broken members is all that is required; while with aluminium racks, the only thing that can be saved is the rack frame itself. On the basis of being able to use the aluminium-tipped rack for a maximum of 200 cycles before repair is necessary, and based on an 8 hr. day production over a period of a year, the cost of a titanium-tipped rack is one-ninth of the aluminium rack. Further, titanium-tipped racks do not require stripping, thus reducing down time and rejects due to improperly stripped contacts. In speaking of titanium-tipped anodizing racks, it must be emphasized that this does not refer to a rack built com-



Typical designs for rack frames



Position of parts on the plating rack



Gravity contacts (above) and positive contacts (below)

pletely of titanium, which is quite expensive.

The one thought that should be foremost when considering the design of the rack is that the most economical rack is the one designed for the specific part, or parts very similar to it. That is the way to achieve maximum plating efficiency and decrease rejects. Often, racks are damaged and need costly rack rework due to the fact that parts that are not specifically suited for them are jammed on, or contacts are allowed to ride through the cycle without parts on them.

Positioning of Parts

A main phase in rack design is the positioning of the parts on the rack. Going back to the primary function of the rack, it is, therefore, required that the parts must be held firm so that they will not float off when entering the solution or, due to their own buoyancy, be allowed to break contact if a bath is being used which requires continuous electrical contact.

The part must be positioned so that it will face the anodes in such a way as to take maximum advantage of anode current distribution and not trap gas in holes or other pockets. Trapped gas prevents the solution from properly wetting the part, starving the surface to be plated of electron-carrying ions, thus resulting in areas without plate.

Improper distribution of parts on the fixture is probably the greatest single cause of rack dissatisfaction. There is no set rule or formula which will act as a guide to determine the proper distance between parts. The best guide for this is practice and experience. However, two fundamentals must be considered in determining rack spacing: the throwing power of the bath and the current density at which it is plated. Table I rates the throwing power of various plating baths and gives the current density at which they are plated.

Parts requiring plating on one side only can generally be held back to back; parts requiring plating on all sides must be staggered, or plated on one side of the rack only. In the case of anodizing, consideration of the throwing power of the bath is not required, as the anodizing solution throws almost perfectly. Often, in the case of pointed objects, the effect of wide spacing (which is generally of benefit) is harmful, due to burning of the points. When that is the case, the pointed portions of the parts may be placed next to each other so that they will have the tendency to rob. As an alternative, actual robbers may be employed. These robbers consist of cathodic portions of the rack placed close to the edges of the parts which may burn so that they, in turn, will receive plating and decrease the current on the work at that point. When auxiliary anodes are used, particular care must be given to spacing the parts. Generally, the parts can be brought closer together, but sufficient space between anode and parts must be provided to avoid touching due to vibration or poor racking, with resultant shorts.

Current Considerations

Another important phase of rack design is the electric current factor. All metals show resistance to current conductivity; therefore, rack members such as frames, tips and hooks must be of ample size to allow current to pass without overheating. Overheating of the rack members causes the coating to burn and, in many cases, overheats the part itself. Both conditions are very detrimental to the plating cycle.

In order to determine the amount of current required, it is necessary to calculate the area of the part that is to receive a full amount of plating plus one-third of the shielded area. This calculated amount is multiplied by the maximum current density employed in the particular plating cycle. Table I gives the average current density at which the various plating baths are used. The actual current-carrying capacity of the rack, hooks, and members cannot be determined easily. A safe figure for copper is 1,000 amp/in^2 of cross-section; however, this can be extended to 2,000 if the plating cycle is short, the solution cool, and good contact is made between the rack contacts and parts.

The rack hook, which makes immediate contact with the cathode bar, is best constructed as a continuation of the frame. This design permits maximum current conductivity and strength. Frames serve a dual purpose of carrying current and supporting parts. This must never be forgotten, and one function must not be sacrificed to the other.

Contacts

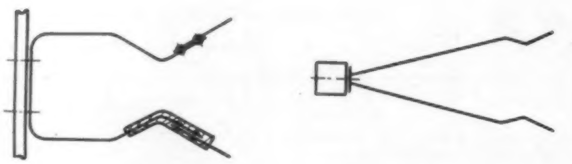
The rack contact is by far the most difficult part to design. The contact must hold the part in such a way that it will not shade the significant areas or make rack marks which can be detrimental to the appearance of the parts. Further, the contact must be placed so that it will not contribute to gas trapping, and must be large enough to carry ample current in order to prevent overheating of the part. One of the faults of poor contact design is the condition called arcing. This occurs when a contact is close to the edge of a part, but does not touch it. When the part is moved out of or into the solution at an electrified station, arcing occurs between the part and contact.

Only two important types of contacts are known to the rack maker: the gravity and the positive contact. The gravity contact, as stated previously, consists of a hook or similar device to which the parts cling by means of their own weight. Such a contact should be designed in such a way that the parts will not float off when entering the

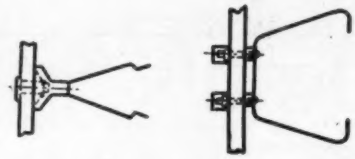
TABLE I—DATA FOR RACK DESIGN

Plating Bath	Current Density Amp/ft^2	Plating Voltage	Throwing Power	Auxiliary Anode Material
Brass	5-20	2-5	Good	Brass, Steel*
Cadmium (Cyanide)	5-50	2-5	Very Good	Cadmium, Steel*
Chromium (Decorative)	100-200	4-6	Very Poor	Lead, Steel*
Chromium (Hard)	200-500	5-12	Very Poor	Lead, Steel*
Copper (Sulphate)	15-50	1-4	Poor	Copper, Lead*
Copper (Cyanide)	20-60	2-5	Good	Copper, Steel*
Gold	10-30	5-6	Good	Stainless
Nickel	20-100	4-8	Fair	Nickel
Silver	5-30	½-2	Excellent	Silver
Tin (Sulphate)	10-40	1-4	Excellent	Tin
Tin (Fluoborate)	25-150	1-4	Excellent	Tin
Tin (Stannate)	10-80	4-6	Excellent	Tin, Steel*
Zinc (Sulphate)	5-50	2-5	Poor	Zinc
Zinc (Cyanide)	15-70	3-6	Good	Zinc, Steel*

**Indicates alternative material.*



Titanium anodizing contact construction, showing (left) titanium tip riveted to strip aluminium and (right) a contact of titanium wire



Designs for replacement contacts

solution or through agitation of the solution, nor hit or swing against each other during the plating process.

The gravity type contact is usually threaded to the main frame or bolted to it so that it will not twist. The threaded type is usually considered replaceable, but must be constructed so that the thread will not break in the frame, making replacement difficult and expensive.

A positive contact is the more complicated of the two to design. One which strives for one-handed racking is the most desirable. This can be accomplished by making the top part of the tips flexible and the bottom firm, or by designing the contacts in such a way that the parts will snap on.

Another point to stress is the fact that positive contacts should be fastened to the frame by means of two bolts, in order to prevent turning or tearing away from the frame. Bolts are preferred over rivets because they give tighter contact and make repair easier. Good rack design always calls for soldering of the positive contact in order to improve the electrical properties. High electrical requirements always go hand in hand with positive contacts. Good engineering principles must always be followed in designing this type of contact, as flexing and stressing of the contacts occur at all times.

Positive type contacts are always used for anodizing. Movement of the part in anodizing cannot be permitted for, if the part moves, the contact will then touch an anodized or nonconductive portion of the part, and anodizing ceases. When working with all-aluminium tips, the fact that the aluminium becomes thinner with each stripping operation must be considered, and extra-heavy contacts must be used at the onset. A titanium tip or a small strip of titanium may be riveted to a larger aluminium strip. In the latter construction, sufficient titanium must be allowed to be able to rivet the aluminium to the titanium, and then permit coating around the interface so as to cover it completely. Titanium has a lower conductivity than aluminium, and this fact must be weighed in using titanium tips. Strength, of course, is never a problem. In anodizing, arcing is a greater problem than in plating and every precaution must be taken to prevent it.

A good replaceable positive contact is the most difficult to obtain. One must attempt to keep these as simple as possible or replacement cost outweighs the advantage of the gain. The replacement components must be kept few and simple, and standard fasteners and standard threads should be used where possible, so that maintenance is easy and stocking not too difficult.

Auxiliary Anodes

Lately the auxiliary anode has become an important factor in rack formulation. Developments in automatic plating machines have enabled the plater to include and add auxiliary anode rails at little extra cost. Of course, still lines can easily be designed to include the auxiliary anodes. The auxiliary anode answers many plating problems, and its use is highly recommended where feasible. An important first step in designing the anode is the proper selection of the material, which must be harmless to the plating bath and yet give the proper plating results. Contrary to many opinions, the auxiliary anode need not conform 100 per cent to the shape of the part to be plated. The ability to "throw" a little extra current towards the area which is difficult to plate, frequently is sufficient to alleviate plating problems.

The best type of anode is one that is completely replaceable and removable. The anode which simply clips on is usually a better choice because the parts can be loaded on the rack first and then the auxiliary anode clipped on. This procedure usually results in easier and faster racking. Stops and other precautions must always be included to eliminate the possibility that the part to be plated will short against the anode. The latter is one of the greatest failures of racks using auxiliary anodes. Not having a current source for the auxiliary anode does not always foreclose the use of one. Bipolar electrodes can be used successfully in many cases.

The bipolar anode differs from the standard anode only by the fact that it has no direct connection with the anode circuit. The principle of this anode relies on the law of physics that, when a conductor is placed in a field of current flow, the current will take the path of least resistance. Thus, if a conductor is placed on a plating rack, completely insulated from the cathodic circuit, the end nearest the anode becomes cathodic and is plated upon, and the end nearest the cathode becomes anodic, thus increasing current flow to the part to be plated.

(To be concluded)

Electroless Cobalt

USING sodium hypophosphite as the reducing medium, electroless deposits of cobalt can be obtained by the reduction of solutions of cobalt salts, according to an article in *Metallwarenindustrie und Galvanotechnik.*

The cobalt deposition can be conducted either in alkaline solutions with a *p*H of 8 to 9, or in acid solution with a *p*H of 4 to 5. From the alkaline baths, a cobalt deposit up to 15 microns in thickness is obtained, and from the acid bath, 1 to 3 microns in thickness. This is the contrary to what happens during the operation of non-current nickel depositing baths.

In alkaline solutions, cobalt chloride is mainly used, to which is generally added Rochelle salt and sodium hypophosphite. The bath is operated at 90°C. and the deposit obtained is matte in appearance. All impurities must be avoided on the surface of the base metal, as well as in the bath solution, the requirements here being much the same as for an electroplating bath. The most adherent deposits are obtained when the crystals of the base metal and those of the coating metal belong to the same crystal type of structure, or have approximating structures.

The speed of deposition of the cobalt is proportional to the ratio:volume of solution/surface. This ratio, in all cases, should not exceed 10. In acid solutions, the speed of deposition depends on the anion; it is a maximum for Cl^- with a deposition speed of 3-4 microns/hr.

With solutions containing cobalt chloride and nickel chloride in equal proportions, a brilliant deposit of 19·2 microns in thickness is obtained.

Comparative tests for resistance to concentrated and dilute (50 per cent) acids, conducted on deposits of nickel and cobalt, showed that nitric acid, both concentrated and dilute, attacks the two deposits. Concentrated sulphuric acid is almost without effect and, when dilute, only attacked the cobalt. Concentrated hydrochloric acid attacked both deposits; when dilute, it only attacked the nickel. Both acetic and phosphoric acid have practically no action.

Industrial News Home and Overseas

Changes of Address

Notice of removal has been sent out by the **British Non-Ferrous Metals Federation,** who have now left their address at Hagley Road, Birmingham, for new premises at 6 Vicarage Road, Edgbaston, Birmingham, 15. The telephone number of the new offices is Edgbaston 3886.

A similar notice has been sent out by the **Non-Ferrous Wrought Metals Export Group,** who share the offices with the B.N.F.M.F.

Price Reductions

Substantially lower prices for "Araldite" epoxy resins have been announced by **CIBA (A.R.L.) Limited.** These reductions have followed immediately upon the completion of a new epoxy resin factory at Duxford with a greatly increased production capacity.

Metals Meeting Decision

At the United Nations meeting which was held in London last week to discuss questions relating to copper, it was agreed that no action was required at this time for inter-Governmental action on the metal. It decided that it was not necessary to establish inter-Governmental machinery, and noted that there was no procedural obstacle to the holding of a further meeting if difficulties should at any time arise. This was disclosed in a press communique issued after the end of the meeting. The forty nations taking part also recommended that Governments and bodies concerned with the copper trade should maintain the present level of statistics, and try and improve statistics by greater uniformity in definition and promptitude in availability. They recommended that the statistical facilities provided by the United Nations should also be utilized.

A number of delegations drew attention to the sharp fluctuations which had occurred in copper prices in recent years. These had harmful effects on all countries interested in the production and consumption of copper. Particular reference was made to the economic and social difficulties experienced by countries which are dependent to a high degree on export markets for the sale of their copper, and whose economies were, therefore, the more directly influenced by conditions prevailing in and measures taken by the copper consuming countries. The difficulties experienced extended beyond the copper industry and affected the external purchasing power of the countries concerned.

After the decision on copper had been arrived at, the position relating to zinc and lead was discussed. As a result of the discussion on these metals, it was agreed that governments of countries trading in lead and zinc should be asked to consider suggestions that production and export of the metals should be reduced. The proposals put forward by the delegates at the meeting were as follows:—

The general level of exports of both lead and zinc ores, concentrates and metal should be reduced for a temporary period of one year or less; machinery should be set up for a prompt review of the situation, with both consumers and producers represented; world mine and smelter output should be reduced; and a study group to examine long-term problems affecting the two metals should be appointed.

World Tin Production

During the first half of 1958, world tin production declined heavily while tin consumption increased slightly, according to world tin statistics for the second quarter of 1958, issued by the International Tin Council. Reviewing the position over the past year, the bulletin says that in the third quarter of 1957, world consumption of tin metal was 4,500 tons less than world production of tin-in-concentrates. In the following quarter, excess production amounted to 11,200 tons. During the first quarter of 1958, production declined heavily (by 27 per cent), while consumption increased slightly; in consequence, consumption exceeded mine production by 2,100 tons. This trend was accentuated in the second quarter. Consumption then was maintained at the same level as in the preceding period, while production declined by a further five per cent.

Production of tin metal in the second quarter of 1958 was 21 per cent less than in the previous quarter, and 31 per cent less than in the last quarter of 1957. World output of tinplate during the first quarter of 1958 was 37 per cent higher than in the preceding quarter. A further increase of about five per cent appears to have taken place in the second quarter.

Figures show that world production of tin-in-concentrates was 43,600 tons in the third quarter of 1957; increased to 47,100 tons in the last quarter, and then decreased to 34,300 tons in the first quarter and to 32,500 tons in the second quarter of this year.

World consumption of primary tin metal decreased from 39,100 tons in the third quarter of last year to 35,900 tons in the fourth quarter, and was 36,400 tons in both the first and the second quarters of this year.

Estimated world smelter production of tin metal for the three months April to June 1958 was 30,200 tons. This excludes any tin produced in the United States from tin-in-concentrates imported during April and May.

Consumption of primary tin metal in the United States during the second quarter of 1958 was 11,690 tons. This represents a slight improvement over the first quarter (11,550 tons). Consumption in the United Kingdom during the second quarter was 5,027 tons, against 4,867 tons in the first quarter.

World tinplate production increased during April to 694,000 tons. On the basis of available figures for the leading producers, output in the three months from April to June is provisionally estimated at 1,960,000 tons.

Metal Spraying Conference

Readers are reminded that the second **International Metal Spraying Conference** is being held in the new College of Technology, Gosta Green, Birmingham, from Monday, September 29, to Friday, October 3 next. The object of the conference is to present to the visiting delegates a series of Papers on subjects of immediate interest to those in the metal spraying industries, including the deposition of plastics and refractory materials by similar methods. Ample opportunity is to be given for discussion of the subject matter of the lectures.

Papers on the various subjects are being presented by delegates from Australia, South Africa, and the European and Scandinavian countries, while visits to works in the Dudley and Wednesbury districts have also been arranged. Full details of the conference may be obtained from the Conference Secretary, The Association of Metal Sprayers, Barclays Bank Chambers, Dudley, Worcs.

Trade with Holland

On the initiative of the Federation of British Industries and of the Association of British Chambers of Commerce, an **Anglo-Dutch Trade Council** has been formed with the purpose of promoting trade between the two countries, to foster good relations between British manufacturers and the purchasers in the Netherlands of British-made goods, to aid U.K. exports with advice on the obtaining of agents and market information, etc., and to make representations where desirable on trade matters to the Netherlands Government and other authorities.

The offices of the newly-formed Council are at 99 Jan Van Nassaustraat, The Hague, Holland, and Mr. H. N. Schepp has been appointed secretary. Manufacturers and export merchants interested in trade with Holland can obtain information about the Council from the Federation of British Industries.

Fuel Technology

Commencing on Thursday next, September 25, the **Sir John Cass College,** Jewry Street, Aldgate, London, E.C.3, is holding a course of lectures on Scientific Principles of Fuel Technology, arranged in conjunction with the Coal Industry Society for those who wish to prepare for the Intermediate examination in this subject arranged by the City and Guilds of London Institute and the Institute of Fuel. It is one of the subjects in the examinations in Fuel Technology arranged by these Institutes.

The fee for the course for those residing in the Administrative County of London is £1 12s. 0d., and application for enrolment form and full syllabus of the course should be made to the Secretary to the College.

Sales Expansion

As a result of the threefold expansion in the sale of **Winston Electronics Ltd.** products, four specialist regional technical sales engineers have now been appointed. Mr. K. P. Reynolds, based in Manchester, will cover Yorkshire, Lancashire, Cheshire and the North. Mr. P. Reeves, based in Birmingham, will cover Derbyshire, Nottinghamshire, Lincolnshire, Staffordshire, Shropshire, Worcestershire, Northamptonshire, Leicestershire and Rutland.

Mr. V. Diederichs will be responsible for London south of the Thames, Gloucestershire, Oxfordshire, Wiltshire, Berkshire, Hampshire, Dorset, Sussex,

Kent and Surrey. Mr. D. A. Jamison will cover the London area north of the Thames, Cambridgeshire, Hertfordshire, Buckinghamshire, Bedfordshire, and Middlesex.

Tasmanian Aluminium

Recent news from Canberra is to the effect that the Australian Government is negotiating for overseas capital to increase the size of the Aluminium Production Commission's plant at Bell Bay in Tasmania, according to the Minister for National Development, Senator W. H. Spooner. He was commenting on reports that the Tasmanian Government was perturbed at the prospect of private enterprise having a hand in the project, and that it has not been consulted.

Senator Spooner rejected suggestions that the Tasmanian Government had not been consulted on the future of Bell Bay. He said that the former Tasmanian Premier, Mr. Robert Cosgrove, had assured him that the Tasmanian Government would favour admission of an outside partner in the Bell Bay project. Earlier this year, he said, he and Mr. Cosgrove had discussed the future of the plant. Both had agreed that production costs were too high, that expansion was needed, and that private capital should be sought to do this.

Blast Cleaning and Dust Collection

Some time ago we were able to give readers the information that **Hepburn Conveyor Company Ltd.**, of Wakefield, had obtained the sole manufacturing rights in Great Britain of the shot-blasting and dust control equipment of the Pangborn Corporation of Hagerstown, U.S.A. The British company has now distributed a leaflet which gives details of the various types of machines in this range, together with a short article on blast cleaning in industry which should be of considerable interest to all concerned in this type of engineering product.

Metal Spinning

News from **H. W. Daw and Son (Spinners) Ltd.**, of Birmingham, is to the effect that they are expecting delivery of a new Bohner and Kohle D50 spinning and flow forming machine next month. This machine, believed to be the only one of its type in this country to be acquired by a private contracting firm, is capable of spinning ¼ in. steel or ½ in. aluminium gauges.

The machine has a bed length of 47½ in. between centres and is capable of swinging a 40 in. diameter blank. It is fully automatic and in its production form shows considerable versatility, but it is understood that Mr. Jack Daw, the company's managing director, is incorporating a number of modifications of his own while the machine is at the assembly stage which will give it an even wider range of applications. Basically, the machine is a tracer controlled heavy-duty lathe, with hydraulic controls for all power-operated movements, and is capable of quantity-producing long or short runs of parts to very fine limits. Production is due to commence at the end of next month or early November.

A Repeat Order

An order from Fabrika Kablova, Svetozarevo, Jugoslavia, for extrusion machinery worth just over £50,000 has recently been received by **Fawcett Preston and Co. Ltd.** The machinery will be used for covering cables with plastics. This is the second order the company—one of the Metal Industries Group—has received from the Jugoslavia firm. The first, announced last January, was valued at £25,000

U.K. Metal Stocks

Stocks of refined tin in London Metal Exchange official warehouses at the end of last week totalled 17,188 tons, comprising London 6,145, Liverpool 9,558, and Hull 1,485 tons. Copper stocks totalled 10,931 tons, and comprised London 5,549, Liverpool 5,107, Birmingham 75, Manchester 50, and Swansea 150 tons.

An Anniversary

It was in Glasgow in 1898 that **John Allan and Company (Glenpark) Ltd.** commenced their business. Their origins were modest; like other more famous companies, they began with a tiny workshop in an obscure back street. "Metal refiners and merchants" was how they described themselves.

To-day the company has issued a small brochure to mark the celebration of its diamond jubilee, and in a foreword the chairman—Sir Charles Westlake—says that through sixty eventful years, from the days of the earliest steam car to the era of the supersonic jet, Allans have been providing industry with the raw materials of its progress.

In 1948, the company became a subsidiary of the Metal Industries Group, and a few years later opened an additional factory at Oldbury. The activities of the company are many and varied. The refining of old metals so that something new can be produced is a never-ending process. It is possible, for example, that a ship's pump, made from Allan ingots, will be returned to them as scrap, will be reconstituted, and sent out into the world again as a door handle or a kitchen tap—or even as another's ship's pump. In addition to a brief history of the company, the brochure also contains a number of interesting photographs.

Trade Luncheon

It is announced by **The Gauge and Tool Makers' Association** that their next trade luncheon will be held at the Savoy Hotel, London, on Wednesday, October 22, at 12.15 p.m. The guest speaker on this occasion will be Mr. Ross Roy, President of Ross Roy Inc., of Detroit, U.S.A., and his probable subject at the luncheon will be "How Can British and American Business Men Best Meet the Present Economic Challenge."

Annual Dinner

On Wednesday, October 29 next, the annual dinner of the **Institute of Production Engineers** will be held at the Dorchester Hotel, London.

Engineering Design

It is understood that in association with the Birmingham Exchange and Engineering Centre, the **Council of Industrial Design** is to sponsor a one-day conference on "Industrial Design and the Engineering Industries," to be held in Birmingham on November 12 next. The conference will be opened by Lord Mills, the Minister of Power, and will be attended by an invited audience of executives from engineering companies in the Midlands. During the conference, a photographic exhibition of well-designed engineering products from the United Kingdom and European countries will be held at the Midland Hotel, Birmingham.

Light Alloys in Shipbuilding

Opening a five-day course on shipbuilding at King's College, Newcastle upon Tyne, on Monday last, Professor L. C. Burrill, head of the Department of Naval Architecture at the college, emphasized the importance of the future use of new materials, such as light alloys and plastics, in shipbuilding. While there was still some hesitancy about "going the whole hog" in using light alloys on a large scale, he thought there was a great deal of advancement in shipbuilding techniques to be found in new materials.

Plant Engineers

A meeting of the South Wales branch of the **Incorporated Plant Engineers** is being held on September 23 next at the South Wales Engineers' Institute, Park Place, Cardiff, when technical films on lubrication methods will be presented by Mr. W. D. Chivers, of Shell-Mex and B.P. Limited.

Vienna Trade Fair

At the Autumn Trade Fair which has been held in Vienna during the first two weeks of this month, the following U.K. firms have provided displays on the stand organized by the Birmingham Exchange and Engineering Centre:—**Edgar Allen and Co. Ltd., Dallow Lambert and Co. Ltd., Higher Speed Metals Ltd., Honeywell Controls Ltd., Metallisation Ltd., Newman, Hender and Co. Ltd., Yorkshire Imperial Metals Ltd.,** and **Zirconal Ltd.**

Aluminium in Ghana

Subject to agreement with the Government, a Canadian firm is expected to erect a factory which will be the first stage in establishing an aluminium fabricating industry in Ghana, according to reports from Accra. Plant will be installed to provide a supply of good quality aluminium building materials at competitive prices.

Welding Laboratory

One of the finest welding laboratories in a technical college will be opened soon at the Matthew Boulton Technical College in Suffolk Street, Birmingham. The new laboratory will train welders and welding engineers to meet the increasing demand by British industry for workmen in these fields. Classes in electric arc welding have been held at the college since 1931. Modern welding equipment for the new laboratory was supplied by **Quasi-Arc Limited.**

The head of the college's engineering department, Mr. J. A. Forrest, has revealed that, in the past, welding students had to be turned away because of lack of space. The opening of the new Advanced College of Technology at Gosta Green, however, had made more accommodation available at Suffolk Street and plans for the new laboratory were developed. Mr. Forrest says the new modern laboratory will enable teaching under ideal conditions of the complete range of welding techniques required by the City and Guilds of London Institute up to the level of the full Technological Certificate. He revealed that the opening of the new laboratory had been planned

to coincide with the start of the new advanced City and Guilds welding syllabus.

The lecturer in charge of welding courses, Mr. R. G. Blackburn, says the vast developments in industrial techniques, with the ever-increasing use of welding processes in atomic energy, shipbuilding, aircraft design, and other fields, will increase the demand for trained welders and welding engineers.

Copper Roofing

One of the most important new building products to be developed for a considerable time is announced by **The Ruberoid Co. Ltd**. The product is Ruberoid copper roofing, the development of which represents a major step forward in roofing manufacture, for the company has succeeded in firmly laminating together copper sheeting and glass fibre based bitumen roofing. The result is a single sheet which combines all the outstanding weatherproofing qualities of bitumen roofing with the best features—including the characteristic appearance—of the traditional copper roof.

The new roofing now becomes available to architects and builders after exhaustive durability and weathering tests, carried out in collaboration with the **Copper Development Association.** It will be used as the top layer of special built-up roofing specifications on all types of buildings requiring an economical, yet attractive, form of high quality roofing. Because it will normally be employed bonded with bitumen compound to an underlay of Ruberoid reinforced glass fibre based roofing, all laps and roof details, such as flashings and aprons, will be fully sealed against water penetration. Side joints of sheets may be lapped flat or produced as standing seams or batten rolls as preferred.

As with the conventional copper surface, this new product develops, as a result of natural processes, a surface film or patina forming a protection against atmospheric corrosion, and eventually assumes the familiar colour of rich grey-green. A noteworthy feature of the surface is the pattern of small regular indentations which form a series of "built-in" expansion joints in the copper sheets.

Ore Deposits in Mexico

New and important ore deposits have been located in the northern regions of Mexico, according to a study carried out by the Board of Renewable and Non-renewable Resources of Mexico.

Sr. Guillermo Aguilar y Maya, President of the Board, stated that "fabulous" copper deposits had been traced at a point called La Verde, in the State of Michoacan, as well as others of lesser importance in the basins of the Balsas and Tepalcatepec rivers, in the same State. The Board was starting a series of studies for the exploitation of these resources, he announced.

Men and Metals

At its meeting last week, the Grand Council of the Federation of British Industries elected **Mr. William H. McFadzean** as deputy president of the

Federation. Mr. McFadzean is chairman and managing director of British Insulated Callender's Cables Limited and other companies in the B.I.C.C. group.

News from the British Oxygen Company Limited is that **Mr. A. P. M. Purdom** has been appointed operations study manager in charge of central operational research and work study.

At a recent meeting of the Council of the Institution of Production Engineers, it was announced that the winners of the silver medals awarded for the best Papers presented in 1956-1957 by a member and a non-member of the Institution were:—**Mr. J. A. Grainger,** A.M.I.Mech.E., M.I.Prod.E., for his Paper on "New Techniques in Sheet Metal Forming," and **Mr. A. J. Thompson,** B.Sc., A.M.I.C.E., for his Paper on "Measuring and Forecasting Cost Data in Highly Variable Production." These awards will be made at the Institution's annual dinner, to be held at the Dorchester Hotel, London, next month.

It is announced that **Mr. E. Player,** deputy chairman and managing director of Birmid Industries Limited and a director of Midland Motor Cylinder Company Limited, and **Mr. F. A. W. Livermore,** who has for the last five years been works director of the latter company, have been appointed joint managing directors of the Midland Motor Cylinder Company Limited.

It has been announced by Head Wrightson Iron Foundries Limited that **Mr. G. Morris** has been appointed foundry works manager. For the last

five years, Mr. Morris has been assistant to the foundry works manager, and was formerly with the South Durham Steel and Iron Company, joining Head Wrightson in 1941 to work in the metallurgical laboratories.

Trade Publications

Efficiency in Melting.—Sklenar Furnaces Limited, 385 Newport Road, Cardiff.

This booklet is a revised edition setting forth the advantages of melting by the use of Sklenar furnaces. Details of the various furnaces are set out, accompanied by statistical data, together with notes on melting costs, adaptability, metallurgical considerations, fuel consumption, typical outputs, and working characteristics, as well as a number of diagrams and illustrations.

Remote Reading. — Walker, Crossweller and Company Limited, Cheltenham, Gloucestershire.

A four-page leaflet describes this company's "Arkon" remote reading instruments for flow, pressure, vacuum or holder readings, together with illustrations of instruments.

Lever Speed Control. — Carter Gears Ltd., Thornbury Road, Bradford, 3, Yorks.

A leaflet gives descriptions and dimensions of the lever speed control for the "F" type Carter hydraulic infinitely-variable speed gears. This leaflet is intended to assist potential users in designing operating mechanisms for use with the lever speed control, and it should be read in conjunction with current technical folders on the variable speed gear issued by the company. Copies of this leaflet may be obtained from the company.

Small Fans and Blowers.—Keith Blackman Ltd., Mill Mead Road, London, N.17.

The small "Tornado" fans and blowers listed in the pages of this brochure are representative of ranges designed, frequently against strict specification, for the ventilating and cooling of industrial equipment, being particularly applicable to the fast-expanding electronics industry. For guidance in locating quickly the fan type of a specific purpose, each is labelled to show its size and type, whilst the relevant duty tables provide capacity details and the duty range.

Overhead Handling Equipment.—British MonoRail Ltd., Wakefield Road, Brighouse, Yorks.

Described as the first comprehensive catalogue giving full details of their complete range of automatic transfer and overhead handling equipment and accessories, this catalogue has been produced by the company. A feature of its design is that each page is a complete leaflet in itself, dealing either with one piece of equipment or illustrating a particular type of equipment. The catalogue is on the loose-leaf principle.

Forthcoming Meetings

September 24 — Institute of British Foundrymen. London Branch. Constitutional Club, Northumberland Ave., London, W.C.2. Presidential Address: D. E. B. Barnard. Film and discussion. 7.30 p.m.

September 26 — Institute of Metal Finishing. Sheffield and North-East Branch. Grand Hotel, Sheffield. "Surface Preparation and Porosity in Electro-Deposited Nickel." P. A. Brook. 7 p.m.

Metal Market News

WITH the exception of lead, which eased slightly, the non-ferrous metals registered gains on balance last week but, broadly speaking, there was a condition of almost complete stability in Whittington Avenue. In spite of the sinister implications in the Far East situation, Wall Street continued to improve almost daily, and the Industrial Index advanced to achieve a new 1958 peak. On the other hand, in the U.K. the steel trade recorded a recession and is now running well below capacity. Traditionally, the non-ferrous industry follows the fortunes of steel and, therefore, the setback on the ferrous side is taken to indicate by many people that the remaining months of this year may well prove to be not so active for copper as the first half. On the New York commodity exchange, conditions were not quite so active last week, but still pretty good, and there is so far no real indication that the big bull movement there is coming to an end. The London talks on copper came to an end in the middle of last week and a communique was issued. This, in effect, told the world that no further inter-governmental action beyond improving statistical information was required just now because the situation in copper was getting better. It was, however, envisaged that should difficulties arise a further meeting could be convened. It is understood that delegates drew attention to the harmful effects on both producing and consuming countries of the wide price fluctuations of recent years. Apparently a good deal of stress was laid on the statistical aspect of the problem, but whether this is the real answer may perhaps be doubted.

Minor fluctuations were seen in the price of standard copper in London last week, and on balance both positions gained £1 to close at £207 5s. 0d. cash and £207 10s. 0d. three months. The turnover was heavy, probably about 13,000 tons including transactions on the Kerb. No change was made in the American price structure, but business in copper does not seem to be particularly brisk over there at present. In midweek it became known that the members of the European Mineworkers' Union on the Copperbelt had voted overwhelmingly in favour of a strike, and later it was announced that there would not be any intervention by the Government. Nevertheless, the week closed on a fairly cheerful note, for news came through that the employers were prepared to make certain concessions. A stoppage would, of course, be a serious and disastrous matter for Northern Rhodesia, quite apart from the losses incurred by the mining companies and their employees.

Another disturbing factor last week was the threat of a strike at the International Nickel Company's plant in Canada which would, of course, affect the supply of nickel as well as that of copper. Considerable quantities of electrolytic copper are shipped from Canada to this country, and should a strike occur and prove to be of long duration, then some consumers in the U.K. might be embarrassed. Fortunately, stocks are believed to be fairly good at the present time. The tonnage lying in L.M.E. warehouses was reported down by 461 tons to 11,031 tons at the beginning of the week.

Stocks of tin, on the contrary, increased by 679 tons to 17,152 tons, and seem to be destined to go still higher. The market was active and there was evidence of Russian selling, for a not inconsiderable tonnage was purchased for cash at £730, which presumably was metal bought on behalf of the Tin Council. After a turnover of about 1,250 tons, cash finished unchanged at £730 10s. 0d., while three months was £2 up at £730. Some 3,700 tons of lead changed hands to close at £70 for September and £71 15s. 0d. December, these prices registering a loss of 27s. 6d. for prompt and 12s. 6d. forward. In zinc, despite better U.S. figures, gains were limited to 12s. 6d. for September and 2s. 6d. December. The turnover was 5,300 tons. On Saturday it became known that, after all, owing to a last-minute breakdown in negotiations, the European mineworkers on the Copperbelt went on strike on Friday night.

Birmingham

Conditions continue rather quiet in the trades using non-ferrous metals in the Midland area. Demand from the motor car factories is well maintained and there is a good rate of activity amongst firms which produce metal fittings used in the equipment of railway rolling stock. Builders of commercial road vehicles are not so well placed for orders as the car producers. The makers of heavy electrical equipment are well situated for work, and order books promise steady work over a long period. Copper wire mills are still fairly busy. Activity in the machine tool trade has declined as compared with a year ago, but there are indications that an upward turn may be expected shortly.

Similarly, in the steel trade the position is no worse, and a slow but gradual recovery is likely during the next six months. Output is considerably below the corresponding period's figures for a year ago. Stocks have been reduced and it is believed that customers will soon re-enter the market, even if buying is restricted to small quantities. Supplies of nearly all products can be obtained fairly quickly. There is still delay in plates and sheets, but structural steel is much easier due to the lull in building. Export trade is slow, and it is difficult to make headway owing to lower prices quoted by Continental manufacturers. Having regard to the high costs of production for British iron and steel, any all-round drop in prices seems unlikely.

New York

Copper did better up to the week-end, but tin weakened. Lead and zinc were moderately active, with Prime Western zinc continuing to gain. The threat of a strike in Northern Rhodesian copper mines and the firmness at London aided custom smelter copper. They reported brisk sales at 26 cents and raised their price to 26¼ cents per lb., a mere quarter of a cent below the producer price of 26½ cents. At the 26¼ cents level, business quietened, but custom smelters generally were in a satisfactory selling position.

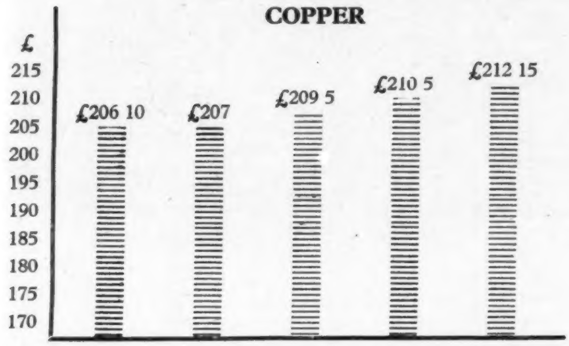
Tin weakened following reports that Germany and Japan would take no action to restrict Russian tin imports. The London market reverted back to the Buffer Pool's buying level, and traders here said consumers still showed limited interest in tin, with small consumers buying meagre tonnage sporadically.

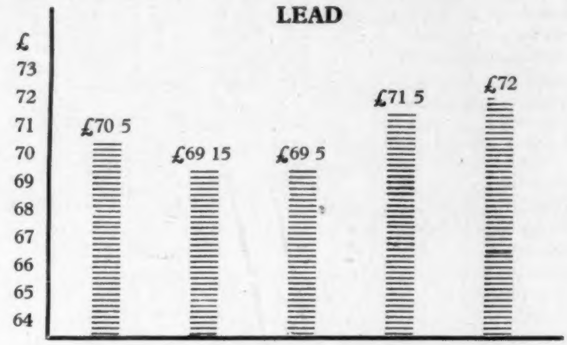
Lead prices continued steady at 10¾ cents per lb. New York, with business moderate. Prime Western demand was improving, reflecting interest from steel mill galvanizers. The price was steady at 10 cents a lb. East St. Louis. The steel galvanizing segment of the steel industry is reported to be running at a much higher rate than other steel making divisions. Zinc producers also reported some gain in demand for special high-grade zinc, but noted it still leaves much room for improvement.

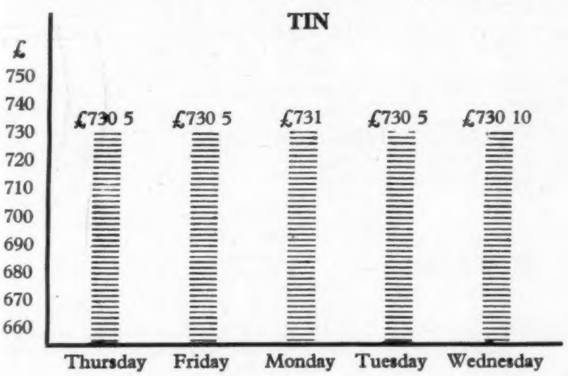
Die-casters in Chicago for their annual meeting indicated that a definite pick-up is being experienced in the output of their industry. While the first six months of 1958 saw an overall drop of approximately 40 per cent in custom die-casting, die-casters said that the bottom of the setback has now been passed. The American Casting Institute figures for the first six months of this year estimated that total 1958 production would be 315,000,000 lb. of aluminium die-castings compared with 376,500,000 lb. in 1957. The 1958 consumption of zinc for die-castings is estimated at 270,000 tons, compared with 351,500 tons in 1957.

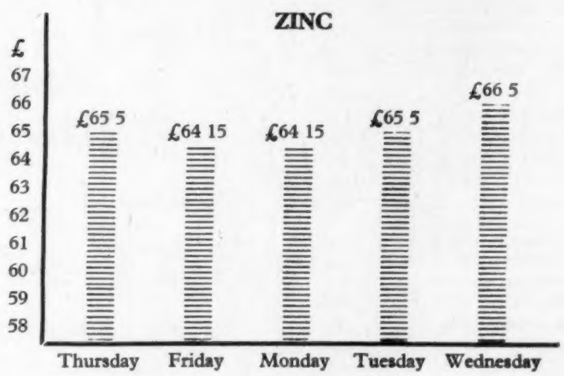
METAL PRICE CHANGES

LONDON METAL EXCHANGE, Thursday 11 September 1958 to Wednesday 17 September 1958









OVERSEAS PRICES

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

	Belgium fr/kg ≏ £/ton		Canada c/lb ≏ £/ton		France fr/kg ≏ £/ton		Italy lire/kg ≏ £/ton		Switzerland fr/kg ≏ £/ton		United States c/lb ≏ £/ton	
Aluminium			22.50	185 17 6	210	182 15	375	217 10			26.80	214 10
Antimony 99.0					195	169 12 6	420	243 12 6			29.00	232 0
Cadmium					1,500	1,305 0					155.00	1,240 0
Copper												
Crude												
Wire bars 99.9							415	240 15				
Electrolytic	29.00	212 0	24.75	204 10	260	226 5			2.65	221 10	26.50	212 0
Lead			10.50	86 15	110	95 15	177	101 10	.88	73 10	10.75	86 0
Magnesium												
Nickel			70.00	578 5	1,205	1,048 7 6	1,300	754 0	7.50	627 2 6	74.00	592 0
Tin	102.25	747 10			893	777 0	1,420	823 12	8.60	719 2 6	94.75	758 0
Zinc												
Prime western			10.00	82 12 6							10.00	80 0
High grade 99.95			10.60	87 10 0								
High grade 99.99			11.00	90 5								
Thermic					107.12	93 2 6						
Electrolytic					115.12	100 2 6	159	92 5	.88	73 10	11.25	90 0

NON-FERROUS METAL PRICES

(All prices quoted are those available at 12 noon 17/9/58)

PRIMARY METALS

		£	s.	d.
Aluminium Ingots	ton	180	0	0
Antimony 99·6%	„	197	0	0
Antimony Metal 99%	„	190	0	0
Antimony Oxide	„	180	0	0
Antimony Sulphide Lump	„	190	0	0
Antimony Sulphide Black Powder	„	205	0	0
Arsenic	„	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	„		9	6
Calcium	„	2	0	0
Cerium 99%	„	16	0	0
Chromium	„		6	11
Cobalt	„		16	0
Columbite	per unit		—	
Copper H.C. Electro.	ton	212	15	0
Fire Refined 99·70%	„	211	0	0
Fire Refined 99·50%	„	210	0	0
Copper Sulphate	„	70	0	0
Germanium	grm.		—	
Gold	oz.	12	10	4¾
Indium	„		10	0
Iridium	„	20	0	0
Lanthanum	grm.		15	0
Lead English	ton	72	0	0
Magnesium Ingots	lb.		2	5½
Notched Bar	„		2	10½
Powder Grade 4	„		6	3
Alloy Ingot, A8 or AZ91	„		2	8
Manganese Metal	ton	290	0	0
Mercury	flask	79	0	0
Molybdenum	lb.	1	10	0
Nickel	ton	600	0	0
F. Shot	lb.		5	5
F. Ingot	„		5	6
Osmium	oz.		nom.	
Osmiridium	„		nom.	
Palladium	„	5	15	0
Platinum	„	23	5	0
Rhodium	„	40	0	0
Ruthenium	„	16	0	0
Selenium	lb.		nom.	
Silicon 98%	ton		nom.	
Silver Spot Bars	oz.		6	4⅛
Tellurium	lb.		15	0
Tin	ton	730	10	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	„		—	
Virgin Min 98%	„	66	4	4½
Dust 95/97%	„	104	0	0
Dust 98/99%	„	110	0	0
Granulated 99+%	„	91	4	4½
Granulated 99·99+%	„	104	2	6

**Duty and Carriage to customers' works for buyers' account.*

INGOT METALS

Aluminium Alloy (Virgin)		£	s.	d.
B.S. 1490 L.M.5	ton	210	0	0
B.S. 1490 L.M.6	„	202	0	0
B.S. 1490 L.M.7	„	216	0	0
B.S. 1490 L.M.8	„	203	0	0
B.S. 1490 L.M.9	„	203	0	0
B.S. 1490 L.M.10	„	221	0	0
B.S. 1490 L.M.11	„	215	0	0
B.S. 1490 L.M.12	„	223	0	0
B.S. 1490 L.M.13	„	216	0	0
B.S. 1490 L.M.14	„	224	0	0
B.S. 1490 L.M.15	„	210	0	0
B.S. 1490 L.M.16	„	206	0	0
B.S. 1490 L.M.18	„	203	0	0
B.S. 1490 L.M.22	„	210	0	0

		£	s.	d.
†Aluminium Alloy (Secondary)				
B.S. 1490 L.M.1	ton	146	0	0
B.S. 1490 L.M.2	„	153	0	0
B.S. 1490 L.M.4	„	170	10	0
B.S. 1490 L.M.6	„	188	10	0

†Average selling prices for mid August

		£	s.	d.
***Aluminium Bronze**				
BSS 1400 AB.1	ton	214	0	0
BSS 1400 AB.2	„	230	0	0
***Brass**				
BSS 1400-B3 65/35	„	139	0	0
BSS 249	„		—	
BSS 1400-B6 85/15	„		—	
***Gunmetal**				
R.C.H. 3/4% ton	ton		—	
(85/5/5/5)	„	171	0	0
(86/7/5/2)	„	179	0	0
(88/10/2/1)	„	229	0	0
(88/10/2/½)	„	239	0	0
Manganese Bronze				
BSS 1400 HTB1	„	166	0	0
BSS 1400 HTB2	„		—	
BSS 1400 HTB3	„	195	0	0
Nickel Silver				
Casting Quality 12%	„		nom.	
„ „ 16%	„		nom.	
„ „ 18%	„		nom.	
***Phosphor Bronze**				
2B8 guaranteed A.I.D. released	„	258	0	0
Phosphor Copper				
10%	„	225	10	0
15%	„	232	0	0

**Average prices for the last week-end.*

		£	s.	d.
Phosphor Tin				
5%	ton		—	
Silicon Bronze				
BSS 1400-SB1	„		—	
Solder, soft, BSS 219				
Grade C Tinmans	„	344	6	0
Grade D Plumbers	„	278	6	0
Grade M	„	377	6	0
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.		—	
Type 9 „	„		—	
Zinc Alloys				
Mazak III	ton	97	7	6
Mazak V	„	101	7	6
Kayem	„	107	7	6
Kayem II	„	113	7	6
Sodium-Zinc	lb.		2	5½

SEMI-FABRICATED PRODUCTS

Prices of all semi-fabricated products vary according to dimensions and quantities. The following are the basis prices for certain specific products.

Aluminium			£	s.	d.
Sheet	10 S.W.G.	lb.		2	8
Sheet	18 S.W.G.	„		2	10
Sheet	24 S.W.G.	„		3	1
Strip	10 S.W.G.	„		2	8
Strip	18 S.W.G.	„		2	9
Strip	24 S.W.G.	„		2	10½
Circles	22 S.W.G.	„		3	2
Circles	18 S.W.G.	„		3	1
Circles	12 S.W.G.	„		3	0
Plate as rolled		„		2	7½
Sections		„		3	1½
Wire 10 S.W.G.		„		2	11
Tubes 1 in. o.d. 16 S.W.G.		„		4	0

		£	s.	d.
Aluminium Alloys				
BS1470. HS10W.	lb.			
Sheet 10 S.W.G.	„		3	0½
Sheet 18 S.W.G.	„		3	3
Sheet 24 S.W.G.	„		3	10½
Strip 10 S.W.G.	„		3	0½
Strip 18 S.W.G.	„		3	2
Strip 24 S.W.G.	„		3	10
BS1477 HP30M. Plate as rolled	„		2	10½
BS1470. HC15WP.				
Sheet 10 S.W.G.	lb.		3	6½
Sheet 18 S.W.G.	„		4	0½
Sheet 24 S.W.G.	„		4	10½
Strip 10 S.W.G.	„		3	9½
Strip 18 S.W.G.	„		4	0½
Strip 24 S.W.G.	„		4	8
BS1477. HPC15WP. Plate heat treated	„		3	5½
BS1475. HG10W. Wire 10 S.W.G.	„		3	9½
BS1471. HT10WP. Tubes 1 in. o.d. 16 S.W.G.	„		4	11
BS1476. HE10WP. Sections	„		3	1
Beryllium Copper				
Strip	„	1	4	11
Rod	„	1	1	6
Wire	„	1	4	9
Brass Tubes	„		1	7⅞
Brazed Tubes	„		—	
Drawn Strip Sections	„		—	
Sheet	ton		—	
Strip	„	228	0	0
Extruded Bar	lb.		1	10⅛
Extruded Bar (Pure Metal Basis)	„		—	
Condenser Plate (Yellow Metal)	ton	165	0	0
Condenser Plate (Naval Brass)	„	176	0	0
Wire	lb.		2	5¼
Copper Tubes	lb.		2	0½
Sheet	ton	238	15	0
Strip	„	238	15	0
Plain Plates	„		—	
Locomotive Rods	„		—	
H.C. Wire	„	257	5	0
Cupro Nickel				
Tubes 70/30	lb.		3	4½
Lead Pipes (London)	ton	110	0	0
Sheets (London)	„	107	15	0
Tellurium Lead	„	£6 extra		
Nickel Silver				
Sheet and Strip 7%	„		3	5½
Wire 10%	„		3	11¼
Phosphor Bronze				
Wire	„		3	9½

Titanium (1,000 lb. lots)

Billet over 4″ dia.-18″ dia.	lb.	63/-	64/-
Rod 4″ dia. - ·250″ dia.	„	75/-	112/-
Wire under ·250″ diam. - ·036″ diam.	„	146/-	222/-
Sheet 8′×2′×·250″-·010″ thick	„	88/-	157/-
Strip ·048″-·003″ thick	„	100/-	350/-
Tube (representative gauge)	„		300/-
Extrusions	„		120/-

		£	s.	d.
Zinc Sheets, English destinations	ton	99	10	0
Strip	„		nom.	

Financial News

Metal Statistics

Detailed figures of the consumption and output of non-ferrous metals for the month of July, 1958, have been issued by the British Bureau of Non-Ferrous Metal Statistics, as follow in long tons:—

COPPER	Gross Weight	Copper Content
Wire	25,542	25,196
Rods, bars and sections	10,450	7,031
Sheet, strips and plate	11,637	9,330
Tubes	7,140	6,572
Castings and miscellaneous	6,254	—
Sulphate	1,206	—
	62,229	53,564
Of which:		
Consumption of Virgin Copper	42,373	
Consumption of Copper and Alloy Scrap (Copper Content)	11,191	

ZINC	
Galvanizing	7,317
Brass	7,160
Rolled Zinc	1,770
Zinc Oxide	2,022
Zinc Die-casting alloy	3,738
Zinc Dust	853
Miscellaneous Uses	934
Total, All Trades	23,794
Of which:	
High purity 99·99 per cent	4,044
Electrolytic and high grade 99·95 per cent	4,283
Prime Western, G.O.B. and debased	8,800
Remelted	513
Scrap Brass and other Cu alloys	3,247
Scrap Zinc, alloys and residues	2,614

ANTIMONY	
Batteries	93
Other Antimonial Lead	49
Bearings	29
Oxides—for White Pigments	101
Oxides—other	105
Miscellaneous Uses	12
Sulphides	5
Total Consumption	394
Antimony in Scrap	
For Antimonial Lead	329
For Other Uses	44
Total Consumption	373

LEAD	
Cables	7,308
Batteries	2,127
Battery Oxides	2,145
Tetra Ethyl Lead	1,514
Other Oxides and Compounds	2,426
White Lead	885
Shot	444
Sheet and Pipe	5,858
Foil and Collapsible Tubes	300
Other Rolled and Extruded	468
Solder	1,078
Alloys	1,565
Miscellaneous Uses	1,083
Total	27,201

CADMIUM	
Plating Anodes	50·35
Plating Salts	8·05
Alloys: Cadmium Copper	3·70
Alloys: Other	3·05
Batteries: Alkaline	5·75
Batteries: Dry	0·30
Solder	3·10
Colours	17·95
Miscellaneous Uses	2·35
Total Consumption	94·60

TIN	
Tinplate	801
Tinning:	
Copper Wire	37
Steel Wire	7
All other	61
Solder	156
Alloys	457
Foil and Collapsible Tubes, etc.	35
Tin Compounds and Salts	89
Miscellaneous Uses	13
Total Consumption	1,656

William Jacks and Co. Ltd.

At the annual general meeting of the company, held in London last week, the chairman, Mr. W. Gray Buchanan, in his speech reported that although the year 1957 was a difficult one for metal merchants, the company had escaped the impact of the sharp fluctuations in prices as well as the political and economic troubles of that year. The company's export trade amounted to some £6 million in value. The turnover for the year was £14½ million. A 15 per cent dividend was recommended.

Glynwed Tubes

For the fourth year in succession, the directors have recommended an interim dividend of 10 per cent on the Ordinary shares.

Efco Limited

Group net profit, after tax, other than profits tax on distributions, amounted to £143,428 for the year ended March 31 last, against £123,883 for the previous year. Recommended dividend is 15 per cent, as against 12½ per cent. In his report the chairman states that the present position of the order book is quite satisfactory.

Cadmium Price Cut

It was announced on Wednesday last that the U.K. price for domestically-produced and Commonwealth cadmium has been reduced to 9s. 6d. per lb. delivered, from 10s.

Scrap Metal Prices

Merchants' average buying prices delivered, per ton, 16/9/58.

	£
Aluminium	
New Cuttings	134
Old Rolled	110
Segregated Turnings	90
Brass	
Cuttings	128
Rod Ends	124
Heavy Yellow	108
Light	103
Rolled	120
Collected Scrap	104
Turnings	118
Copper	
Wire	178
Firebox, cut up	175
Heavy	169
Light	164
Cuttings	178
Turnings	160
Braziery	140
Gunmetal	
Gear Wheels	168
Admiralty	168
Commercial	143
Turnings	138
Lead	
Scrap	62
Nickel	
Cuttings	—
Anodes	450
Phosphor Bronze	
Scrap	143
Turnings	138
Zinc	
Remelted	55
Cuttings	42
Old Zinc	30

The latest available scrap prices quoted on foreign markets are as follow. (The figures in brackets give the English equivalents in £1 per ton):—

West Germany (D-marks per 100 kilos):		
Used copper wire	(£178.7.6)	205
Heavy copper	(£174.0.0)	200
Light copper	(£143.10.0)	165
Heavy brass	(£108.15.0)	125
Light brass	(£78.7.6)	90
Soft lead scrap	(£61.0.0)	70
Zinc scrap	(£34.17.6)	40
Used aluminium unsorted	(£87.0.0)	100
France (francs per kilo):		
Copper	(£208.17.6)	240
Heavy copper	(£208.17.6)	240
Light brass	(£143.10.0)	165
Zinc castings	(£65.5.0)	75
Lead	(£82.12.6)	95
Tin	(£565.10.0)	650
Aluminium	(£117.10.0)	135

Italy (lire per kilo):		
Aluminium soft sheet clippings (new)	(£191.10.0)	330
Aluminium copper alloy	(£119.0.0)	205
Lead, soft, first quality	(£84.12.6)	146
Lead, battery plates	(£49.17.6)	86
Copper, first grade	(£194.7.6)	335
Copper, second grade	(£179.17.6)	310
Bronze, first quality machinery	(£188.10.0)	325
Bronze, commercial gunmetal	(£159.10.0)	275
Brass, heavy	(£130.10.0)	225
Brass, light	(£119.0.0)	205
Brass, bar turnings	(£127.12.6)	220
New zinc sheet clippings	(£55.2.6)	95
Old zinc	(£40.12.6)	70

THE STOCK EXCHANGE

Industrials Strengthened On A Wide Front

ISSUED CAPITAL •	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 16 SEPTEMBER	+RISE —FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1958 HIGH	1958 LOW	1957 HIGH	1957 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	21/7½	+1½d.	9	10	8 6 6	21/7½	17/6	28/3	18/–
400,000	2/–	Anti-Attrition Metal	1/6		4	8½	5 6 9	1/6	1/3	2/6	1/6
33,639,483	Stk. (£1)	Associated Electrical Industries ...	53/9	+6d.	15	15	5 11 6	53/9	46/6	72/3	47/9
1,590,000	1	Birfield Industries	58/–	+2/6	15	15	5 8 0	58/–	46/3	70/–	48/9
3,196,667	1	Birmid Industries	74/9		17½	17½	4 13 9	76/3	55/3	80/6	55/9
5,630,344	Stk. (£1)	Birmingham Small Arms	31/6	—1½d.	10	8	6 7 0	32/3	23/9	33/–	21/9
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	15/6		5	5	6 9 0	15/7½	14/7½	16/–	15/–
350,580	Stk. (£1)	Ditto Cum. B. Pref. 6%	17/3		6	6	6 19 3	17/3	16/6	19/–	16/6
500,000	1	Bolton (Thos.) & Sons	25/–		12½	12½	10 0 0	28/9	24/–	30/3	28/9
300,000	1	Ditto Pref. 5%	15/6		5	5	6 9 0	16/–	15/–	16/9	14/3
160,000	1	Booth (James) & Co. Cum. Pref. 7%	20/–		7	7	7 0 0	19/4½	19/–	22/3	18/9
9,000,000	Stk. (£1)	British Aluminium Co.	54/9	+3d.	12	12	4 7 9	54/9	36/6	72/–	38/3
1,500,000	Stk. (£1)	Ditto Pref. 6%	19/3	+4½d.	6	6	6 4 9	19/3	18/4½	21/6	18/–
15,000,000	Stk. (£1)	British Insulated Callender's Cables	44/6	—6d.	12½	12½	5 12 3	46/–	38/9	55/–	40/–
17,047,166	Stk. (£1)	British Oxygen Co. Ltd., Ord. ...	39/3	—3d.	10	10	5 2 0	40/–	29/–	39/–	29/6
600,000	Stk. (5/–)	Canning (W.) & Co.	22/7½	+4½d.	25+ *2¼C	25	5 2 0	22/7½	19/7½	24/6	19/3
60,484	1/–	Carr (Chas.)	1/10½		25	25	9 6 9X	2/3	1/4½	3/6	2/1½
150,000	2/–	Case (Alfred) & Co. Ltd.	4/1½		25	25	12 2 6	4/9	4/–	4/6	4/–
555,000	1	Clifford (Chas.) Ltd.	20/–		10	10	10 0 0	20/–	16/–	20/6	15/9
45,000	1	Ditto Cum. Pref. 6%	15/9		6	6	7 12 6	15/10½	15/7½	17/6	16/–
250,000	2/–	Coley Metals	3/3		20	25	12 6 3	4/6	2/6	5/7½	3/9
8,730,596	1	Cons. Zinc Corp.†	52/9	—9d.	18¾	22½	7 2 0	53/6	41/–	92/6	49/–
1,136,233	1	Davy & United	68/3	—3/–	20	15	5 17 3	72/6	45/9	60/6	42/6
2,750,000	5/–	Delta Metal	21/–		30	*17½	7 2 9	22/4½	17/7½	28/6	19/–
4,160,000	Stk. (£1)	Enfield Rolling Mills Ltd.	34/6	—3d.	12½	15B	7 5 0	35/–	22/9	38/6	25/–
750,000	1	Evered & Co.	27/3		15Z	15	7 6 3	28/3	26/–	52/9	42/–
18,000,000	Stk. (£1)	General Electric Co.	37/–	+6d.	10	12½	5 8 0	38/7½	29/6	59/–	38/–
1,500,000	Stk. (10/–)	General Refractories Ltd.	37/6	+9d.	20	17½	5 6 9	37/6	27/3	37/–	26/9
401,240	1	Gibbons (Dudley) Ltd.	62/6	+1/–	15	15	4 16 0	66/3	61/–	71/–	53/–
750,000	5/–	Glacier Metal Co. Ltd.	6/6	+6d.	11½	11½	8 17 0	6/6	5/6	8/1½	5/10½
1,750,000	5/–	Glynwed Tubes	17/6		20	20	5 14 3	17/6	12/10½	18/–	12/6
5,421,049	10/–	Goodlass Wall & Lead Industries ...	25/6	+9d.	13‖	18Z	5 2 0	25/9	19/3	37/3	28/9
342,195	1	Greenwood & Batley	50/6	+1/9	20	17½	7 18 6	50/6	45/–	50/–	46/–
396,000	5/–	Harrison (B'ham) Ord.	14/1½	+4½d.	*15	*15	5 6 3	14/1½	11/6	16/9	12/4½
150,000	1	Ditto Cum. Pref. 7%	19/–		7	7	7 7 3	19/–	18/9	22/3	18/7½
1,075,167	5/–	Heenan Group	8/7½		10	20‡	5 16 0	8/7½	6/9	10/4½	6/9
216,531,615	Stk. (£1)	Imperial Chemical Industries ...	34/–		12Z	10	4 14 0	34/–	27/7½	46/6	36/3
33,708,769	Stk. (£1)	Ditto Cum. Pref. 5%	17/–		5	5	5 17 9	17/1½	16/–	18/6	15/6
14,584,025	**	International Nickel	153¾	+3½	$3.75	$3.75	4 7 6	154¾	132¾	222	130
430,000	5/–	Jenks (E. P.), Ltd.	7/9		27½ϕ	27½	8 17 6	8/3	6/9	18/10½	15/1½
300,000	1	Johnson, Matthey & Co. Cum. Pref. 5%	16/3		5	5	6 3 0	16/9	15/–	17/–	14/6
3,987,435	1	Ditto Ord.	41/3		10	10	4 17 0	45/3	36/6	58/9	40/–
600,000	10/–	Keith, Blackman	22/6	+1/3	17½	15	7 15 6	22/6	15/–	21/9	15/–
160,000	4/–	London Aluminium	4/4½		10	10	9 2 9	4/4½	3/–	6/9	3/6
2,400,000	1	London Elec. Wire & Smith's Ord. ...	47/3	—3d.	12½	12½	5 6 0	47/6	39/9	54/6	41/–
400,000	1	Ditto Pref.	23/3		7½	7½	6 9 0	23/3	22/3	25/3	21/9
765,012	1	McKechnie Brothers Ord.	37/6	+9d.	15	15	8 0 0	37/6	32/–	48/9	37/6
1,530,024	1	Ditto A Ord.	36/–	+1/–	15	15	8 6 9	36/–	30/–	47/6	36/–
1,108,268	5/–	Manganese Bronze & Brass	12/3		20	27½‡	8 3 3	12/3	8/9	21/10½	7/6
50,628	6/–	Ditto (7½% N.C Pref.)	5/9		7½	7½	7 16 6	6/3	5/9	6/6	5/–
13,098,855	Stk. (£1)	Metal Box	57/–	+1/–	11	11	3 17 3	57/–	41/9	59/–	40/3
415,760	Stk. (2/–)	Metal Traders	7/9	—4½d.	50	50	12 18 0	8/1½	6/3	8/–	6/3
160,000	1	Mint (The) Birmingham	20/–		10	10	10 0 0	22/9	19/–	25/–	21/6
80,000	5	Ditto Pref. 6%	79/6		6	6	7 11 0	83/6	79/6	90/6	83/6
3,705,670	Stk. (£1)	Morgan Crucible A	40/6		10	10	4 18 9	40/6	34/–	54/–	35/–
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	17/6	+6d.	5½	5½	6 5 9	17/6	17/–	19/3	16/–
2,200,000	Stk (£1)	Murex	49/3	—1/6	17½	20	7 2 0	58/9	47/9	79/9	57/–
468,000	5/–	Ratcliffs (Great Bridge)	10/–	+7½d.	10	10	5 0 0	10/–	6/10½	8/–	6/10½
234,960	10/–	Sanderson Bros. & Newbould ...	24/9		20	27½D	8 1 6	27/–	24/6	41/–	24/9
1,365,000	Stk. (5/–)	Serck	15/3	+1½d.	17½Z	15	3 16 6	15/3	11/–	18/10½	11/6
600,400	Stk. (£1)	Stone (J.) & Co. (Holdings)	65/6	+1/9	18	16	5 10 0	63/9	43/9	57/6	43/9
600,000	1	Ditto Cum. Pref. 6½%	23/6		6½	6½	5 10 9	24/3	19/6	21/9	18/9
14,494,862	Stk. (£1)	Tube Investments Ord.	60/9	+1/3	15	15	4 18 9	60/9	48/4½	70/9	50/6
41,000,000	Stk. (£1)	Vickers	34/–	+3d.	10	10	5 17 9	34/–	28/9	46/–	29/–
750,000	Stk. (£1)	Ditto Pref. 5%	15/–	+9d.	5	5	6 13 3	15/6	14/3	18/–	14/–
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	21/9		*5	*5	7 1 3A	23/–	21/3	24/9	20/7½
2,200,000	1	Ward (Thos. W.), Ord.	78/3	—1/9	20	15	5 2 3	80/9	70/9	83/–	64/–
2,666,034	Stk. (£1)	Westinghouse Brake	39/–		10	18P	5 2 6	40/–	32/6	85/–	29/1½
225,000	2/–	Wolverhampton Die-Casting ...	9/6	+9d.	25	40	5 5 3	9/6	7/1½	10/1½	7/–
591,000	5/–	Wolverhampton Metal	19/6		27½	27½	7 1 0	19/9	14/9	22/3	14/9
78,465	2/6	Wright, Bindley & Gell	4/–		20	17½E	12 10 0	4/0½	3/3	3/9	2/7½
124,140	1	Ditto Cum. Pref. 6%	12/7½	+6d.	6	6	9 10 3	12/7½	11/3	12/6	11/3
150,000	1/–	Zinc Alloy Rust Proof	2/10½		27	40D	9 7 9	3/1½	2/7½	5/–	2/9

*Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting **Shares of no Par Value. ‡ and 100% Capitalized Issue. •The figures given relate to the issue quoted in the third column. A Calculated on £7 14 6 gross. Y Calculated on 11¼% dividend. ‖ Adjusted to allow for capitalization issue. E for 15 months. P and 100% capitalized issue, also "rights" issue of 2 new shares at 35/– per share for £3 stock held. D and 50% capitalized issue. Z and 50% capitalized issue. B equivalent to 12½% on existing Ordinary Capital after 100% capitalized issue. ϕ And 100% capitalized issue. X Calculated on 17½%. C Paid out of Capital Profits.